KSC-SPEC-G-0002
Revision B
July 1, 1986

COMPILING CONSTRUCTION COST ESTIMATES, SPECIFICATION FOR

ENGINEERING DEVELOPMENT DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center

KSC-SPEC-G-0002
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COMPILING CONSTRUCTION COST ESTIMATES, SPECIFICATION FOR

Approved:

JAMES D. PHILLIPS
DIRECTOR OF ENGINEERING DEVELOPMENT

JOHN F. KENNEDY SPACE CENTER, NASA

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SPECIFICATION FOR COMPILING CONSTRUCTION COST ESTIMATES

1. SCOPE

This specification has been approved by the Engineering Development Directorate of the John F. Kennedy Space Center (KSC) and is mandatory for use by KSC and associated contractors.

This specification covers preparation of cost estimates for NASA projects at KSC. Requirements and guidelines herein provide the details required for cost breakdown and uniformity of cost presentation in estimates compiled for each of the codes listed in paragraph 2.

2. CLASSIFICATION

Cost estimates shall be classified as follows:

a.	Code A1	Budget
b.	Code A2	Preliminary Engineering Report
c.	Code B	Labor and Materials Unit
d.	Code C	Detailed Construction
e.	Code C-95	Detailed Construction (incorporated comments and changes from a 90-percent design review)
f.	Code C-100	Final Construction (consists of the approved C-95 estimate and cost factors added by NASA/KSC)
g.	Code D	Change Order
h.	Code E	Government Cost Estimate for Arch/Engineer Work
i.	Code F	Other

3. REFERENCES

The following references (latest issue) provide materials for guidance in preparing cost estimates.

3.1 Federal Regulations.

a.	FAR	Federal Acquisition Regulation

3.2 Department of Defense.

a.	AR-415-17	Construction Empirical Cost Estimate for Military Construction and Cost Adjustment Factors (March 1980)
b.	TM-5-800-2	Department of Army Preparation of Cost Estimates, Military Construction, General Criteria (May 1966)

3.3 National Aeronautics and Space Administration.

3.3.1 Headquarters.

a.	NHB 5100.4	Federal Acquisition Regulation Supplement (NASA/FAR Supplement, April 1984)
b.	NHB 8820.2	Facility Project Implementation Handbook (March 1981)
c.	SPECSINTACT	NASA Standard Construction Specification Syster. (October 1982)

3.3.2 Kennedy Space Center.

a.	DE-PD 5110.1	Government Estimates for Construction/Installatior Procurements (February 10, 1977)
b.	KSC-SPEC-G-0003	Ground Support Equipment Cost Estimating (July 5, 1977)
c.	TR-1508	Budget Cost Data For Facility Construction Elements (November 18, 1985)
d.	TR-1511	KSC Monthly Facility Construction Cost Index (January 16, 1986)
e.	TR-1495	KSC - Estimating Orientation (November 2, 1976)

3.4 Department of Labor, Bureau of Labor Statistics.

Bulletin 917	Handbook of Work and Output (June 1947)

3.5 Occupational Safety and Health Administration.

Occupational Safety Construction Standards and Interpretations & Health Act, Vol. II. (May 31, 1985)

3.6 Other.

a. American Association of Cost Engineers Annual Meeting Transactions - 1985

b. Industrial Psychology and Its Social Foundation, Harper & Brothers

4. PRICING SOURCES

Estimators shall have ready access to reference books, catalogs, and other documents usable as sources of current price information. Source documents recommended for use in compiling cost estimates for NASA/KSC projects are provided in paragraphs 4.1 through 4.3.

4.1 General.

a. Building Construction Cost Data, Robert Snow Means - 1986

b. Building Cost File, Southern Edition, Construction Publishing Co., Inc. - 1985

c. Compilation of Nationally Averaged Rental Rates for Construction Equipment, Associated Equipment Distributors - 1985

d. Contractors' Equipment Ownership Expense, Associated General Contractors of America, Inc. - 1985

e. McGraw-Hill Cost Information Systems/Dodge Cost Publications

1985 Dodge Construction Systems Costs
1985 Dodge Manual for Building Construction
1985 Dodge Digest of Building Costs and Specifications
1985 Dodge Guide to Public Works and Heavy Construction Costs

f. Engineering News Record, McGraw-Hill, Inc. - 1986

g. Estimators' Equipment and Installation Manhour Manual, John S. Page - 1978

h. Estimators' General Construction Manhour Manual, John S. Page, Gulf Publishing Co. - 1977

j. Net Prices Catalog, McMaster-Carr Supply Company - 1985

k. Building Estimators Reference Book, Frank R. Walker Co. - 1986 (22nd ed).

l. ORR System of Construction Cost Management Vol. I through IV - 1980-83

m. Cost Engineering By AACE (monthly magazine)

n. Cost and Optimization Engineering, Dr. S.C. Jelen - 1970

4.2 Mechanical.

a. Cost Manual for Piping and Mechanical Construction, Herbert Herkimer, copyright: 1958, last printing: 1979. 1958 to 1986 units are the same.

b. Estimators; Manhour Manual on Heating, Plumbing, Air Conditioning, and Ventilation, John S. Page, Gulf Publishing Company. Last printing: 1978

c. Estimators' Piping Manhour Manual, Page and Nation, Gulf Publishing Company. Last printing: 1976

d. Labor Calculator, National Association of Plumbing, Heating, and Cooling Contractors. Last printing: 1971

e. Mechanical Estimating Guidebook, John Gladstone, McGraw-Hill. Last printing: 1981

f. Tool Rental Guide, Mechanical Contractors Association of America, Inc. - 1985

g. Machine Shop Estimating, W.A. Nordhoff, McGraw-Hill. Last printing: 1976

h. Manufacturing Cost Eng. Handbook, E. Malstrom, Marcel Dekker. Last printing: 1984

4.3 Electrical.

a. General Cable, General Cable Corporation - 1985

b. Estimators' Electrical Manhours Manual, Gulf Publishing Company. Last printing: 1979

c. GESCO Estimator, The General Electric Supply Company - 1985

d. Graybar Catalog, Graybar Electric Company, Inc. - 1985

e. National Price Service Monitor, Henderson-Hazel Corporation - 1985

f. Unistrut General Engineering Catalog and Prices - 1985

g. NECA Manual of Labor Units, National Electrical Contractors Assoc. - September 1985

h. Electronic Industry/Cost Eng. Data, Fred G. Hartmyer, Ronald Press Co. - 1964

5. ESTIMATE PREPARATION

5.1 General Requirements. Cost estimates shall be prepared on NASA/KSC furnished forms. Legible originals shall be submitted so that the estimate can be reproduced by quality photocopy process. The original and three copies of the estimate shall be provided to the lead design engineer.

Cost estimates for all codes shall be prepared in the same careful manner as if bidding in competition with an experienced, qualified contractor engaged in similar construction work, and shall be based on a normal 40-hour work week. When a project has more than one building/structure, or when different types of funding must be accounted for, the cost estimate must be prepared for each part of the project, respectively. The latest cost data available shall be used or noted why not used.

The estimator/cost engineer shall obtain the necessary design information to estimate the project in the detail required, especially when working with performance specifications and Preliminary Engineering Reports (PER's) that require but do not define systems and equipment, such as sprinkler and Halon systems, cranes, hoists, electrical/electronic control systems, and program-oriented ground support equipment.

Detail material quantity takeoff and labor hours with respective pricing shall be summarized for each of the work elements and will be related to their respective 16 divisions of SPECINTACT. These work elements shall be carried forward to an overall project summary, broken down in the following major work elements:

a. I Site work

b. II Building and/or structures to the 5-foot line, including all interior architectural/structural, interior mechanical and interior electrical work

c. III Utilities outside the 5-foot line

d. IV Any specialized construction

Estimates shall cover all work shown on the plans, specifications and other pertinent documents. The lead design engineer will be notified, in writing, of conflicts in the plans and specifications or other unclear areas.

Appendices A through G contain the degree of detail required for each type of estimate and the required format. One CofF project has been selected to serve as an example, and illustrates the increase in detail expected as the design progresses from concept through completion.

5.2 Special Requirements.

5.2.1 Budget Cost Estimate (Code A1). This estimate is used to prepare a prospectus or other request for project authorization. It is the initial determination of the project scope that can be completed for a stipulated amount, and serves as a basis for overall program planning and control, for establishing equitable fees in negotiations with A/E firms, and for comparative cost analyses. The cost estimate shall be prepared using NASA/KSC Form 1510 or another form as specified by NASA/KSC, and formatted for submittal in accordance with appendix A.

5.2.2 Per Cost Estimate (Code A2). This estimate is the product of detailed analyses of user requirements determining a design that should result in lowest possible life cycle cost for the proposed project. The PER incorporates all information needed to formulate a basis for design and includes the basis for requirements, analyses of facility functions or work, evaluation of different approaches and recommended solutions, a cost estimate that accommodates additional and reasonable cost escalation and contingency factors, construction schedules, plot plans, drawings, schematics, equipment lists, and peripheral considerations (real estate requirements, erosion control, pollution control, environmental factors), as applicable. Cost estimates for PER's shall be prepared in accordance with NHB 8820.2, using KSC Form 21-193. The estimates shall be formatted for submittal in accordance with appendix B.

An example of the detail required in PER estimates is provided in appendix B. Units of measure and descriptions used in the estimate shall be as listed in TM-5-800-2, Measurements and Checklist. The development of the estimated cost for design and engineering services shall also be included with the estimate.

5.2.3 Labor and Materials Cost Estimate (Code B). This estimate combines costs for labor and material into single unit costs and may be required for preliminary design concepts and cost tradeoffs to support a preliminary design review. Code B estimates, when required, shall be prepared using KSC Form 21-224, and shall be detailed with costs broken down in accordance with appendix C.

5.2.4 Detailed Construction Cost Estimate (Code C). This estimate shows separate costs for labor and materials associated with each divisional task estimated for the construction project. Unless otherwise specified, they will be prepared for each design review milestone through 100 percent design completion, and updated at the midpoint of the bidding period or as often as directed by the cognizant lead design engineer. All code C estimates shall indicate the degree of completion of the design review milestone (C-30, C-60, C-90, as applicable). Code C estimates shall be prepared using KSC Form 21-243 and be detailed to the extent that all work is identified and costs are listed. The estimate shall be summarized and formatted for submittal in accordance with appendices D and/or E, as applicable. The code C estimate shall be prepared for each item that NASA/KSC designates for the bid schedule.

Supporting data is required for all code C estimates and shall be prepared on KSC Form 19-75 (figures F-3 and F-4) or on other suitable estimating forms, as shown in figures F-1 and F-2 (KSC Form 21-471). The supporting data shall provide identification of:

a. Detail material quantity takeoff, labor hours, and related price computations or quoted prices

b. Price sources and direct quotations from at least three sources for all major material and equipment cost items to verify estimated cost (i.e., type, size, and quantity) and showing the date, source, address and the expected delivery time required for each item

c. Government-furnished equipment value in today's dollars and related contractor handling costs, if applicable

d. The estimator's review comments on the drawings and specifications related to value engineering cost reduction, exotic and costly material, or fabrication and erection methods, as applicable

Information in supporting data sheets shall be referenced to the estimating sheet number(s) where corresponding cost figures appear.

Items b, c, and d shall be submitted with each estimate (see appendix F for examples and required format). Item a, such as detail material, quantity takeoff, labor hours and related price calculations, minor price data and analysis, and minor cost studies, shall be retained by the contractor and submitted, if required, by the lead design engineer.

5.2.5 Construction Cost Estimate (Code C-95). This estimate represents the 100 percent design package and incorporates changes and comments approved during a 90 percent design review. It reflects the final estimate of project cost and may not include any special conditions. The special conditions will be included in the C-100 estimate. No contingencies other than the government contingency specified shall appear in the estimate. The C-95 estimate shall be formatted for submittal in accordance with appendix D.

5.2.6 Bid Cost Estimate (Code C-100). This estimate, often called the government estimate, is a refined C-95 cost estimate. It must reflect any amendments to the bid package, special conditions, or any other changes since the C-95 estimate was delivered to the government. The final estimate shall be based on all bid documents, including Invitation for Bid (IFB), Request for Proposal (RFP), and Solicitation Offer & Award (SOA). This estimate will be used as the government estimate. The estimate shall be summarized and formatted for submittal in accordance with appendix E and shall contain as backup the refined C-95 estimate. If the government estimate is 15 percent or more above or below the lowest bidder, the agency/firm responsible for the estimate shall provide written rationale, to the lead design engineer, including a revised government estimate for the variance between the bid and the government estimate.

When errors are uncovered, or when the scope of work changes subsequent to NASA/KSC approval, the estimate shall be revised. Portions of the estimate that undergo revision shall be identified as REVISED and shall indicate the date the revisions were incorporated.

5.2.7 Change Order Cost Estimates (Code D). These estimates are prepared for proposed changes to existing contracts, and are used to negotiate these changes in scope of work. Code D cost estimates require greater detail than estimates prepared for new construction and facilities modification projects. It may be desirable to organize the NASA/KSC estimate in accordance with the format used by the contractor to facilitate rapid resolution of cost differences existing between the two estimates. To the extent possible, code D cost estimates shall conform to format requirements specified in paragraph 5.3. The code designation shall indicate the review milestone (D-30, D-60, D-95), as applicable. When engineering releases a change showing the "WAS" and "IS" views, this does not necessarily mean the "WAS" condition was actually accomplished. The cost engineer/estimator shall verify the site condition.

Timing and issuance of contract change orders initiating preparation of code D cost estimates are important factors. All facets of the work shall be studied, including construction tasks, status of materials procurement by the contractor, change order impact on the contractor's work progress program, and others that influence overall project costs. Examples of cost elements to be evaluated are:

a. Demolition or modification of work in place

b. Salvage value and cancellation charges for material

c. Abnormal work hours for which premium pay rate is paid

d. Reworking drawings

e. Reprogramming work schedule

f. Temporary work to permit orderly progress in adjacent areas

5.2.8 Government Cost Estimate for Architect - Engineer Work (Code E). An independent government cost estimate for architect engineer services shall be prepared and furnished to the contracting officer before commencing negotiations for each proposed contract or contract modification expected to exceed $25,000. The estimate shall be prepared on the basis of a detailed analysis of the required work as though the government were submitting a proposal. See figure B-4, A&E Design, Cost Estimate, Drawing and Manhour Cost, for sample detail breakdown of drawing and man-hour cost.

5.2.9 Other Cost Estimates (Code F). These estimates are compiled as specified by NASA/KSC to support special studies, surveys, program analyses, and effective project construction cost management. Format, item identification, pricing, organization and coverage shall be as specified by NASA/KSC.

5.2.10 Current Cost Estimate (CCE). This estimate is the cost that reflects the latest and best total project estimated cost available based on design or construction progress. The CCE constitutes the most realistic estimate of ultimate final project costs. It includes the engineering cost to build the project in today's dollars, plus contingencies; escalation to the midpoint of construction; and Supervision, Inspection, and Engineering Services (SI&ES). This is also related to the budget cost as we define it in studies and PER's.

5.2.11 Comparison of Budget and Estimate Costs. Differences in budgeted and estimated costs require early identification. In order to maintain continuous monitoring of costs, each code C estimate project summary shall be marked up to reflect escalation to the midpoint of construction, SI&ES, and government contingency in accordance with appendix G, so that a comparison of budget and estimated project costs can be assessed. This summary shall be included in each estimate over $100,000. Form number: KSC Form 21-368

5.3 Format. Cost estimate submittals shall be formatted and contain the information specified in paragraphs 5.3.1 and 5.3.2.

5.3.1 Cover Sheet. This sheet shall identify the project title and location; drawing number, project control number (PCN), work order (WO) number and contract number as applicable; appropriate estimate code identification (see paragraph 1.2); and date of submittal. The preparing organization shall be identified by name, address, phone number, and signature of approving official (see appendices D and E for required format). Form number: KSC Form 21-565

5.3.2 Estimate Sheet Headings. The information on the cover sheet shall be inserted in the appropriate heading blocks of each sheet in the estimate. The name and position of the estimator(s) and checker(s) shall appear in the heading of each sheet. Headings in trades' summaries shall indicate the numbers of the drawing sheets used for takeoffs, as well as the drawing number and total sheets (see appendix D for required format).

5.3.3 Summaries.

5.3.3.1 Work Element Summary. This summary is required for all estimates and shall provide cost breakdown of labor, material, equipment, and markup for each work element of the cost estimate (see appendix D, figures D-4, D-5, D-6, D-7, and D-8 for required format).

5.3.3.2 Project Summary. This summary is required for all estimates and shall be summarized into the four major work elements reflecting building square foot costs and system cost by units of measure (cubic yards, tons, linear feet, square feet, pounds), as applicable (see appendix D, figure D-2 for required format).

5.3.3.3 General Conditions and Overhead Summary. This summary is required for all code C estimates and shall identify costs of prime contractor overhead items, such as field supervision, quality assurance, compliance with requirements of volume III of OSHA and home office administration (see appendix D, figure D-3 for required format).

5.3.3.4 Special Conditions Summary. This summary is required for all code C-100 estimates. It summarizes costs resulting from imposition of bid documents and conditions under which the project work will be performed (see appendix E, figure E-5).

5.3.3.5 System Summary. This summary recaps all summaries by work element according to the 16 divisions of SPECSINTACT. The system summaries, when required, shall list the respective division and related corresponding quantities and unit costs. Required for all estimates over $100,000 with C-90, C-95 submittals (see appendix G, figure G-1 for required format). Form number: KSC Form 21-371

5.3.3.6 Labor Material Cost Summary. This summary, when required, shall list labor and material costs, marked up with taxes, insurance, contractor overhead, profit and bond for each work element of the cost estimate. Required for all estimates over $100,000 with C-90, C-95 submittal (see appendix G, figure G-2 for required format). Form number: KSC Form 21-369

6. ACCEPTANCE CRITERIA

Cost estimates shall be prepared and formatted in accordance with paragraphs 5.1 through 5.3 and delivered to the lead design engineer. Written waivers to these requirements may be granted jointly by the NASA/KSC lead design engineer and lead cost engineer.

7. ESTIMATE PRACTICES

General estimating practices to be used for construction estimates are as follows:

a. Cost Breakdowns. Estimates should be broken down in as much detail as possible. As design nears 100 percent, the greater the detail required in the cost breakdown. Cost breakdowns should indicate materials by individual type, kind, and size priced by units of measure listed in TM-5-800-2, Measurements and Checklist. For example, a structural concrete cost breakdown should show, as applicable, separate concrete costs for footings, columns, beams, walls, and slabs; the cost for each type of reinforcing steel; the cost for each type of formwork material; and costs for other associated tasks and materials.

b. Price Comparisons. A comparison of all major labor and material prices should be made against current prices for similar features of work and adjusted for differences in site, local vendors, and subcontractor prices. The date and source of comparison should be noted on the estimate sheet. If quoted prices or studies of conditions in the geographical area show labor and material costs varying considerably from those in published pricing guides, costs resulting from specific evaluation of job site conditions should be used. Excessive price variations should be justified.

c. Costs Summary. A summary consisting of the total accumulation of all like costs (i.e., material and labor) should be provided. Direct and indirect costs should be included as a part of the summary. Costs of subcontracted items should be separately identified.

d. Mechanical and Electrical. Detailed mechanical and electrical estimates should have quantity of materials required and labor in manhours, with total manhours multiplied by current pricing rates. This should be compared with the KSC cost index. The estimate should include a concise listing of all parts of a project to which units of material and labor costs are assigned.

Estimates for mechanical and electrical installation should be coordinated with other trades, so that all essential items or work are accounted for.

e. Alternate Work. Estimated costs for alternate work, when applicable, should be identified and priced out. Each alternate should be summarized separately and should not be included in the basic project cost summary.

f. Price Guides and Quotations. Prices obtained from pricing guides and direct quotation should be used solely to verify the estimator's prices for labor, materials, and equipment. The estimator should break down, in detail, prices obtained from pricing guides and quotes into labor, material, equipment, and other contractor costs (see structural steel price breakdown, (appendix F, figures F-2 and F-3). A specific quotation should supersede published prices and shall be identified as such. The latest cost data available shall be used in evaluation prices. TR 1508 and 1511 are normally more appropriate and current for KSC projects. A detailed cost analysis may be required when quotes appear to be too high or too low.

g. Sales Tax. The current sales tax in the area local to the project site should be added to the material costs and, if applicable, to equipment rental costs.

h. Payroll Taxes and Insurance. A percentage should be added to labor dollar totals to cover payroll taxes and insurance (PT&I) items, such as social security (FICA), unemployment insurance (state and federal), workman's compensation, public liability and property damage (including vehicles), and allowances for hazardous trades. TR-1508 and TR-1511 should be used for current percentage rates to be applied to the labor dollar totals.

i. Labor Rates. Labor rates estimates should be based on information in the KSC construction cost index, latest issue, or other NASA-approved sources.

j. Markups. Prime contractor and subcontractor costs should be separately identified. The percentage for prime contractor markup for subcontractor work should appear in the individual summary sheets, as applicable.

k. Profit and Bond. Contractor profit and bond (bid, payment, performance) should be identified.

l. Separation of Work. Estimates for work beyond the 5-foot line of the building/structure should be separately developed.

m. The value of government furnished equipment (GFE) shall be estimated in accordance with figure F-4, Method 1, GFE Estimating, on KSC Form 19-75, in lieu of KSC Form 242. The GFE handling, insurance, and storage factor costs shall be included and summarized with the appropriate trades.

The value of GFE shall be listed on the project summary and system summary for funding and budget purposes, but not in project totals.

7.1 General Construction. Labor, material, equipment, (including mill cost, shop fabrication costs, and erection cost for structural steel), should be clearly identified. Applicable taxes, overhead, markup, subcontractor profit and bond associated with installation should be identified, as applicable. All labor costs should be estimated in manhours before converting to dollars.

7.2 Specialized Construction. Because of the specialized nature of NASA/KSC activities, facility projects often require construction of exotic systems, such as hypergolic fuel distribution, which are not normally encountered in routine construction projects. Such specialized construction tasks should be titled, sequenced, priced, and identified so as to be clearly defined in the estimate.

7.3 Facilities Modifications. For repair and modification of existing facilities, estimators should take into consideration existing conditions as determined through study of as-built drawings and visits to the job site. Inherent in this class of project are lost time for demolition prior to starting new work, and joint occupancy conditions which materially reduce labor productivity. These items should be considered when assigning labor costs. To estimate modification cost accurately, estimators shall address the following:

a. What mechanical, electrical, or other systems and equipment are to be removed or relocated?

b. At what point does the new work join the existing system?

c. How will the new work be installed in terms of existing and proposed architectural and structural design?

d. What restrictions are imposed as to working hours?

e. What temporary work is required to keep certain areas and functions in operation during the course of the work?

f. What disposition is to be made of materials and equipment scheduled to be removed, relocated, turned over to NASA/KSC, or become the property of the contractor?

Identification of demolition work required by contractors should be identified in estimates.

8. WITHHELD WORK ALLOWANCES

If a portion of the total project work is to be performed by a separate contract or other means and is to be withheld from the final design, request for bids, or contract award, the estimated cost of this portion of the work should be titled WITHHELD WORK ALLOWANCE in the cost estimate summary. Withheld work allowance costs shall not be included in the sum of project costs titled estimated construction bid cost, but should be identified separately below this title. Summary sheets, when required, shall be inserted at the end of the estimate.

9. SAFEGUARDING

Preparation of estimates for NASA/KSC shall be considered private data. Records, interdepartmental and interagency correspondence, or material that in any way relates to preparation of estimates for NASA/KSC shall be considered administratively confidential and accessible only to authorized NASA/KSC personnel or representatives. Codes C, D, and E -90, -95 and -100 cost estimates shall be stamped FOR OFFICIAL USE ONLY. Supporting data not

attached to the bid schedule estimates should be retained by KSC Engineering Development. After bid opening, a copy of the supporting data will be made available to the NASA/KSC Procurement Office.

9.1 Security of Government Estimates. Use new salmon-colored cost estimate cover sheet see (figures D-1 and E-1) on all original codes C, D, E, and G cost estimates. Order KSC Form 21-565 to cover all estimates.

Control of government estimates:

a. Estimates distributed on a "need-to-know" basis, only.

b. Limited copies - minimum required for: Lead Design Engineer (LDE), Lead Cost Engineer (LCE), Project Engineer (PE), System Engineers (SE), Construction Activation & Tests Office (DE-CAT), PROCUREMENT. Each copy should be numbered as required.

c. C/G 90-95-100 shall be signed and handcarried.

d. C/G 90-95-100 shall be kept in a secure manner.

9.2 Cancellation of Protective Markings. Protective markings on cost estimates may be cancelled with written permission from DD-FED immediately after the announcement of the successful bidder or at the completion of the project.

9.3 Estimates and Negotiations. Only the latest available NASA-approved cost estimates shall be used as aids in negotiations.

10. ABSTRACT AND STUDY DOCUMENTS

KSC abstract and study documents shall record NASA/KSC estimating performance and facility design costs, and shall be compiled and maintained by a NASA designee as follows:

a. The KSC Abstract of Construction Bid Costs shall list all construction projects released for bid by NASA/KSC and shall record the project title, PCN, and work order number; bid opening date, number of bidders, name of awarded contractor, and amount of the low, average, and high bids; amount of NASA/KSC estimate, percentage difference between low bidder and NASA/KSC estimate, the position of the NASA/KSC estimate relative to all other bids, remarks concerning differences between the NASA/KSC estimates and amount of the bids; and other information as specified by NASA/KSC.

b. A cost study to determine the actual design and estimating costs related to the construction costs, when requested, shall list for the projects under consideration the PCN number, work order number, job title, and description. The study results for design and estimating costs shall be summarized as follows:

(1) Design Costs:

(a) The total manhours to achieve the design

(b) The total number of design drawings

(c) The average manhours per design drawing

(d) The average cost per drawing

(e) The average cost per manhour

(f) The design cost as a percent of construction cost

(2) Estimating Costs:

The cost of estimating the project will be summarized in the same manner as design costs.

11. RESPONSIBILITY

When government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

NASA-John F. Kennedy Space Center
Kennedy Space Center, FL 32899

Preparing Activities:

John F. Kennedy Space Center
Engineering Development Directorate
Facilities Engineering Division

APPENDIX A

BUDGET COST ESTIMATE
(CODE A1)

NASA

Facility Project Cost Estimate

INSTALLATION/PROGRAM OFFICE: KSC LC-39 Shuttle	DATE: May 1, 1983
PROJECT TITLE: Construct Ordnance Building (PSCL)	SUBMISSION/REVISION:
	PROJECT CODE: A-1
BASIS OF COST ESTIMATE: Previous Apollo Project	PROJECT NO: PCN 77406

I SUMMARY OF COST ESTIMATE

DESCRIPTION	AMOUNT a	PERCENT b
1 ENGINEERING ESTIMATE	$1,038,200	
2 COST ADJUSTMENT (Enter percentage of item 1a to right in col 2b)	$ 355,300	34 22
3 SUBTOTAL (1 + 2)	1,393,500	
4 CONTINGENCIES (Enter percentage of item 3 to right in col 4b)	139,400	10
5 SUPERVISION INSPECTION AND ENGINEERING SERVICES (Enter percentage of items 3a and 4a to right in col 5b)	153,300	10
6 OTHER BURDEN COSTS		
7 TOTAL BUDGET ESTIMATE (3 + 4 + 5 + 6)	$1,686,200	62.43

8 IDENTIFICATION OF COST ADJUSTMENT (Item 2 above) AND OTHER BURDEN COSTS (Item 6 above)

Based on Jan. 83 Cost with escalation 8-1/2% per year compounded annually from Jan. 83 to Aug 86 = 43 months (Mid Point Construction) Cost Adj Factor, use 34.22

1.085 X 1.085 X 1.085 X 1.0508 = 1.34217 Use 1.3422 or 34.22

II PLANNING AND DESIGN

DESCRIPTION	STATUS: NEEDED a	IN-WORK b	COMPLETE c	IN HOUSE AE d	COST e
1 PRELIMINARY ENGINEERING REPORT				A&E	$ 56,800
2 SPECIAL STUDIES (Specify)				A&E	$113,600
3 FINAL DESIGN					
4 SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES					
5 TOTAL PLANNING AND DESIGN COST ▶					$170,400

III RELATED COST DATA (Not included in this Approved Facility Cost Estimate but required to make the facility initially operable)

1 RELATED COSTS INVOLVED: ☐ a YES (Identify in items 2 through 10) ☐ b NONE

2 PER (Amount): $56,800

3 DESIGN (Amount): $113,600

	ITEM	AMOUNT	ITEM	AMOUNT
OTHER RELATED EQUIPMENT	4 TO BE PURCHASED		8 ACTIVATION	
	5 TRANSFER TO EXCESS		9 OTHER REAL ESTATE	
	6 EXISTING		10 OTHER (Specify)	
	7 FUTURE FUNDING			

NASA FORM 1510 MAY 80 PREVIOUS EDITIONS ARE OBSOLETE
PAGE 1 OF 2 PAGES

Figure A-1. Project Cost Estimate, Summary (Sheet 1 of 2)

INSTALLATION/PROGRAM OFFICE	PROJECT CODE	DATE
KSC, LC-39 Shuttle	PCN 39143	May 1, 1983

IV FACILITY PROJECT COST ESTIMATE

	DESCRIPTION	UNIT OF MEASURE (1)	QUANTITY (2)	UNIT COST ENGNG (3)	UNIT COST BUDGET (4)	TOTAL COST ENGNG (5)	TOTAL COST BUDGET (6)
1	INTEREST IN REAL ESTATE						
2	SITE DEVELOPMENT & UTILITIES OUTSIDE 5 FOOT LINE (Summary) — Site Work - Fill, Demol. Grass	CY	7,000	7.90	20.54	88,500	143,800
	Paving 1-1/2" Bitum. 6" L.R. Base	SY	3,300	10.00	16.30	33,000	53,600
	Utilities, Sew. Water HTHW	LF	2,500	30.00	48.72	75,000	121,800
3	BUILDING/STRUCTURE WITHIN 5 FOOT LINE (Summary) — Building - Arch. Struct.	SF	4,100	45.46	73.85	186,400	302,800
	Reinf. Concr. Frame Rebar	CY	220	110.00		24,200	
	Form Work	SFCA	7,000	2.30		16,400	
	Masonry Block 8X8X16	SF	10,000	2.50		25,000	
	Struct St. Misc & Bar Joist	TONS	10	25.00		25,000	
	Roofing Insulation & SM	SF	4,100	3.50		14,350	
	Doors, Window, Hardware	SF	300	30.00		9,000	
	Finishes - Paint, Floor, Ceiling etc	SF	4,100	3.65		14,950	
	Conveying System Bridge Crane	TON	15	2,500.00		37,500	
	Mechanical	SF	4,100	13.66	22.17	56,000	90,900
	Plumbing & Compress. Air	FIXTURES	16	1,000.00		16,000	
	Air Conc Heat & Ventiliation	TON	20	2,000.00		40,000	
	* Electrical	SF	4,100	135.20	219.59	554,300	900,300
	Power Lights, Ground Mis	SF	4,100	23.00		94,300	
	Exterior Sub Station M.H.	KVA	2,000	230.00		460,000	
	Specialized-GN_2 Pneu. Syst. S.S.	LF	50	200.00	324.00	10,000	16,200
	Equip & Solar Heat		A/R	350.00	56,800.00	35,000	56,800
6	SOURCE OF COST DATA: KSC Cost Index & Ordnance Fac. 1966	7			TOTALS ▶	1,038,200	1,686,200

V RELATED ITEMS/ACTIONS (Explain as appropriate. Use extra sheets, as necessary, for this block and above)

**NC COLATERAL EQUIP IS REQUIRED - FORM HAS BEEN MODIFIED TO ACCOMMODATE ADDITION LINE ITEMS FOR MORE ACCURATE EST.

ESTIMATE OF THE BUDGET CONFIDENCE CONFIDENCE FACTOR

A. OFF-THE-SHELF ±15 D. R&D ±100
B. PREPRODUCTION ±50 D. OTHER _____

NASA FORM 1510 MAY 80 PREVIOUS EDITIONS ARE OBSOLETE
PAGE 2 OF 2 PAGES

GPO 870 364

Figure A-1. Project Cost Estimate, Summary (Sheet 2 of 2)

APPENDIX B

PRELIMINARY ENGINEERING REPORT COST ESTIMATE (CODE A2)

Preliminary Engineering Report. Code A-2

PCN: 39143 DATE: May 1, 1984

SECTION III - COST ESTIMATE SUMMARY

A. Engineering Estimate:

The cost figures in the Engineering Estimate were arrived at by using KSC Cost Index TR-1511 and January 1984 cost data for building construction, including applicable taxes and insurance and Contractor's markup and bond.

B. Budget Estimate:

The cost figures in the Budget Estimate indicated on the following standard format pages were arrived at by applying the following formula as required by NMI 7330.2A:

Budget estimate = E (1+C) (1+F) (1+G)

E is the engineering estimate

C is the contingency factor = 10%

F is the cost-rise factor based on 9% for 1984, 9% for 1985, 8 months of 1986 @ 9% = 6% for 1986 compounded annually from January 1984 to the mid-point of construction, assumed to be August 1986 = 1.26 1.09 X 1.09 X 1.06 = 1.259 Use 1.26

G is the outside agency administrative cost factor-estimated cost for outside agency and/or AE firm contract supervision and inspection including any design required during construction phase = 10%

The Budget Estimate markup therefore is: 1.10 by 1.26 by 1.10 = 1.525. Round to and use 1.53 on the Engineering Estimate.

C. Design and Engineering Services:

Total costs of the design phase including Professional Fees for the preparation of Plans and Specifications, the making of Surveys and Field Studies, and any outside Agency supervision of design are estimated to be $97,200 (see figure B-4).

In the estimate, grand totals for categories are underlined, subtotals within the categories appear in brackets, and sub-subtotals within the categories appear in parentheses.

Figure B-1. Section III, Cost Estimate Summary

ESTIMATOR· VARNDELL, PRC-2421
CHECKER · WRIGHT, PRC-2421

May 1, 1984
PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
a	Interest in Real Estate						
b	Site Development and Util. outside 5' line	6,700	CY	90.60	138.61	607,000	928,710
	Special Const. GN_2 line	50	LF	.80	275.40	9,600	13,770
c	Building/Structure to 5' Line	SF	4,100	105.85	161.96	434,000	664,020
	Arch Structural	SF	4,100	63.41		[260,000]	
	Mechanical	SF	4,100	19.27		(79,000)	
	Plumbing	Fixture	14	864.29		(12,100)	
	Compressed Air	Outlet	5	5.50		(2,750)	
	Air Cond. Sys	Tons	20	3,207.50		(64,150)	
	Electrical	SF	4,100	23.17		(95,000)	
d	All other collateral EQ	EA	1	3,600.00	55,080.00	36,000	55,080
e	Special feature, Solar Heat	4,100	SF	.98	1.49	4,000	6,120
f	TOTAL	SF	4,100	265.85	406.74	1,090,000	1,667,640

KSC FORM 21-193 (REV. 8/75)

Figure B-2. Construction of Facilities, Estimate of Cost, Engineering and Budget Costs

ESTIMATOR VARNDELL, PRC-2421
CHECKER · WRIGHT, PRC-2421

May 1, 1984
PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING, LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
a	Interest in Real Estate						
b	Site Development & Utilities Outside 5' Line	4,100	SF	148.05	226.51	607,000	928,710
	Site Work	SF	4,100	25.37	38.81	[104,600]	[159,120]
	Demolition - Paving	SY	610	3.80		2,320	
	Earth Work - Fill	CY	6,700	8.00		53,600	
	Paving - 1-1/2" Bitum	SY	3,100	5.65		17,510	
	6" Rock Base	SY	3,100	9.08		28,150	
	Grassing	SY	5,600	1.85		10,360	
	Utilities	LF	1,700	36.47	5,580.00	[62,000]	[94,860]
	Sewer Line 4" - 6"	LF	200	25.00	5,000.00		
	Water Lines & Wet Tap 6" - 10"	LF	1,000	32.00	3,200.00		
	High Temp. Hot Water 1-1/2" Sup & Ret	LF	500	50.00	2,500.00		
	Exterior Utilities	KVA	2,000	220.50	337.37	[441,000]	[674,730]
	Sub Station - Pad-Fence Ground, WP	KVA	2,000	120.00		240,000	
	Manholes	EA	2	506.00		10,000	
	Duct Bank - 4W4, 2W4, 2W3	LF	700	30.00		21,000	
	Power Lines 3C -4/0 PILCNJ 15KV	LF	1,000	2.50		12,500	
	13.8 KV LB Switch	EA	2	10,000.00		20,000	
	3000A Secondary Mains	EA	2	20,000.00		40,000	

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 1 of 6)

ESTIMATOR: VARNDELL, PRC-2421
CHECKER WRIGHT, PRC-2421

May 1, 1984
PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING, LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Exterior Utilities (cont)						
	3000A Tie Breaker	EA	1	200,000.00		200,000	
	3000A Feeder Breaker	EA	3	12,500.00		37,500	
	600A Feeder Breaker	EA	8	5,000.00		40,000	
	Specialized Const. GN_2 S.S	LF	50	180.00		9,000	
c	Building - Structural to 5' Line	SF	4,100	105.85	161.96	434,000	664,020
	Arch/Structural	SF	4,100	63.41	97.02	[260,000]	[397,800]
	Earth Work	CY	200	14.60		2,920	
	Concrete						
	Footing 3000#	CY	32	90.00		2,880	
	Structural, Columns 3000 #	CY	85	150.00		12,750	
	Tie Beam 3000#	CY	10	165.00		1,650	
	Form Work						
	Footing and Slab	SFCA	900	2.50		2,250	
	Structural Columns	SFCA	5,500	3.50		19,250	
	Tie Beams	SFCA	350	3.50		1,225	
	Rebar - Reinf. Steel	LBS	9,000	.85		7,650	
	WWM6X6 6/6	SF	4,500	.45		2,025	
	Conc Slab - Finish, Cure, Harden	SF	4,100	2.00		8,200	
	Gypsum Roof Deck on 1" Insul Board	SF	4,100	2.50		10,250	
	Masonry, Conc Block Inter & Exter	EA	11,000	2.10		23,100	

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 2 of 6)

ESTIMATOR VARNDELL, PRC-2421
CHECKER WRIGHT, PRC-2421

May 1, 1984
PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING, LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Masonry, Conc Block Inter & Exter (cont)						
	Mortar	CY	22	86.00		1,890	
	Wall Reinforcing	LF	8,000	.15		1,200	
	Struct. Steel - Bar Joist Etc.	LBS	10,000	1.85		18,500	
	Beams, Columns & Misc.	LBS	11,000	1.85		20,350	
	Roofing - 5 Ply BUT & G	SF	4,100	1.70		6,970	
	Roofing Insulation	SF	4,100	1.60		6,580	
	Wall Insulation	SF	4,100	1.50		6,150	
	Membrane Waterproof 3 Ply Hot Mod	SF	4,100	1.50		6,150	
	Sheet Metal - Alum/Copper	SF	570	5.15		2,935	
	Caulking - Polysulfied	LF	2,000	2.20		4,400	
	Doors, Frame Hardware	EA	4	2,500.00		10,000	
	Special Vertical Lift - 3 Ea (81")	SF	260	40.00		10,400	
	Inflatable Seals	LF	150	35.00		5,250	
	Painting - Ext Conc/Masonry	SF	7,500	.20		9,000	
	Exterior Conc/Masonry	SF	11,000	.35		3,850	
	Struct & Misc Steel	SF	10.5	345.24		3,625	
	Conveying Sys. OH Crane Bridge Stl.	LB	1,800	2.00		3,600	
	Hoist Drums - 10 HP & Trolley 5 HP	TON	15	3,000.00		45,000	

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 3 of 6)

ESTIMATOR: VARNDELL, PRC-2421
CHECKER : WRIGHT, PRC-2421

May 1, 1984
PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING, LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Mechanical	SF	4,100	19.27	24.48	[79,000]	[120,870]
	Plumbing & Fixture	FIXTURES	14	864.29		(12,100)	
	Compressed Air	OUTLETS	5	550.00		(2,750)	
	Air Conditioning, Heating & Ventilation	TONS	20	3,207.50		(64,150)	
	A/C Compressor 25 H.P.	TON	20	1,000.00		20,000	
	Air Cooled Condensor	EA	1	7,780.00		7,780	
	Air Handling Unit DX Coils	EA	1	5,760.00		5,760	
	Piping Fitting & Misc	LF	100	5.15		515	
	Ductwork Alum & Galv.	LBS	3,000	3.50		10,500	
	Duct Insulation 1" Fiberglass	SF	3,200	1.70		5,440	
	Grills & Diffuser	EA	35	60.00		3,675	
	Misc. Test & Bal. Crane	HR	60	60.00		3,600	
	Power Roof Ventilator, 300 CFM	EA	4	1,720.00		6,880	
	Electrical	SF	4,100	23.17	35.45	[95,000]	[145,350]
	Air Terminal 5/8" O X 24	EA	12	95.00		1,140	
	Outlet Boxes & Control	EA	37	35.00		1,295	
	Switches	EA	15	35.00		525	
	Recpt. 3W, 2P, 120-FP	EA	20	150.00		3,000	
	Wire - #2-14 AWG IC	LF	11,000	2.00		22,000	
	#2-0	LF	1,300	4.30		5,590	
	Conduit 3-3-1/2" Galv. Rigid & Fitting	LF	50	17.20		860	
	1-1/2-2" Galv. Rigid & Fitting	LF	400	6.00		2,400	
	1/2-1" Galv. Rigid & Fitting	LF	2,300	1.90		4,370	

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 4 of 6)

ESTIMATOR VARNDELL, PRC-2421
CHECKER · WRIGHT, PRC-2421

May 1, 1984
PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING, LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Light Fixtures 200W VGA Vapor	EA	6	170.00		1,020	
	100W VGA-1HR	EA	32	260.00		8,320	
	2x4 - 4LP Flour	EA	6	345.00		2,070	
	Mercury Vap 400W	EA	20	260.00		5,200	
	Emergency Bal.	EA	2	1,030.00		2,060	
	Panels, A/C, ITC, PCIA, TCP	EA	5	2,065.00		10,325	
	Misc. Lamps, Test & C/O	HR	200	20.00		4,000	
	Motor Control Center	EA	1	12,200.00		12,200	
	Grounding Sys. Rods Recp	EA	20	345.00		6,900	
	Flood Light Mounting Poles	EA	5	345.00		1,725	
d	All Other Collateral Equipment Not Included in Above						
	Data Processing Eq IBM 460	EA	1	36,000.00	55,905	36,000	55,905
e	Special Features	SF	4,100	.98	1.49	4,000	6,120
	Solar Water Sys - Collectors	SF	40	35.00		1,400	
	100 Gal Insul. Tank Galv.	EA	1	1,475.00		1,475	
	Piping & Misc	HR	25	45.00		1,125	
f	TOTALS	SF	4,100	265.85	406.74	1,090,000	1,667,640

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 5 of 6)

ESTIMATOR VARNDELL, PRC-2421 May 1, 1984
CHECKER WRIGHT, PRC-2421 PCN 77406

CONSTRUCTION OF FACILITIES - ESTIMATE OF COST
KSC SHUTTLE ORDNANCE BUILDING, LC-39

1	2	3	4	5	6	7	8
				UNIT COST		TOTAL COST	
CODE	DESCRIPTION	UNIT OF MEASURE	QUANTITY	ENGINEERING	BUDGET	ENGINEERING	BUDGET
	Quotes:						
	(1) 2,000 KVA substation Gx 2/1/85 Ms. Brown, Atlanta						
	(2) Copper Wire -Anaconda 3/5/85 Mr. Ed Walters - Orlando, FL						
	(3) IBM 460-4/3/85 Mrs. B. Machino Jacksonville, Fl						
	(4) A/C Compressor Condensors, Air Handling Unit Trane 1/30/85 Mr. Walt Harris Miami, FL						
	(5) 3000A Secondary Mains GF 4/21/85 Mr. Bill Mills, Tampa, FL						

KSC FORM 21-193 (REV. 8/75)

Figure B-3. Construction of Facilities, Estimate of Cost, Quantities and Unit Costs (Sheet 6 of 6)

COST ESTIMATE FOR A&E DESIGN

ESTIMATOR: Joe A. Brown DATE: May 1, 1984

CHECKER:

PCN: 39143

TITLE: KSC SHUTTLE ORDNANCE BUILDING, LC-39

	Estimated Drawings	Estimated Hours Per Drawing (1)	Total Hours
Civil	4	60	240
Arthitectural	8	60	480
Structural	6	70	420
Mechanical	6	80	480
Electrical	6	90	540
Utilities	6	90	250
Special Systems			
GN_2 SS	2	95	190
Solar Syster	1	75	150
Total	39		2,800
Specifications 300 pages @1 hour			300
(3) Special Field Studies 5 Man-week = 200 hr. Cost Estimate - 30%, 60%, 90%, 100% & Final = 5 Estimates 60 Hr. ea x 5 Estimates = 300 Hrs			200
39 Dwg Sht's @7-1/2 Hrs per sheet = 292.5 Hrs Therefore, use 300 hours to prepare cost estimates			300
			3600 Hrs

(4)

3600 Hrs @ $27.00 per hour = $97,200 Estimated Cost. (Enter this cost in Section III C of PER Design and Engineering Services).
Project Budget Cost Estimated $1,090,500 without Data Processing Equip (c.)

Cost per drawing = $\frac{97,200}{39} = 2492$

Design Cost as a Percentage of Budget Cost = $\frac{97,200}{1,667,640} = 5.8\%$ (2)

(1) Hours/Drawing is total for Drafting Engineering, Printing, Conferring and Local Travel.

(2) Percentage increase due to additional Design Engineering, on new and existing drawings, which also required additional Field Studies.

(3) When special studies or other services are required they should be listed separately.

(4) Submit breakdown of how M/H cost is developed.

Figure B-4. A&E Design, Cost Estimate, Drawing and Manhour Cost

APPENDIX C

LABOR AND MATERIALS COST ESTIMATE (CODE B)

KSC PRELIMINARY COST ESTIMATE WORK SHEET

W O NO	ECN	DATE PREPARED	SHEET 17 OF 17
0299-0576	32009-39143	Nov 1, 1984	

PROJECT: ORDNANCE BUILDING

LOCATION: KSC LC 39 — CODE: B 30

ARCHITECT ENGINEER: J.B. SMITH INC ROCKET CITY, UTAH 1400 APOLLO BLVD. — ESTIMATOR: J.A BROWN CCE

DRAWING NO: 79K67392-E1-5 — CHECKED BY: WM BARNDEN JB SMITH — APPROVED BY: J B SMITH PRES

ITEM NO	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	16 ELECTRICAL EXTERIOR				
	A TRENCHING-BACKFILL				
	EXCAV & BACK-HAND	18	CY	15.14	273
	CONC. PAD 4" 3000 PSI	100	SF	7.57	757
	FENCE 6'-0" CLINK-3 BARB WIRE	50	LF	10.00	500
	B MED & HI-VOL POWER LINES				
	4" CONDUIT FEW & COMM	310	LF	10.00	3,100
	4" CONDUIT EL & FITTINGS	10	EA	39.35	394
	3C #1/0 PILC NJ 15KV CABLE	360	LF	7.22	2599
	PRIMARY CABLE SPICE & TERM	3	EA	272.33	817
	GROUNDING SUB-STATION	20	SF	45.40	908
	C 300 KVA POWER CTR DBL ENDED	300	KVA	219.47	65,841
	225 & 1,000 AMP CRMT BKRS	7	EA		QUOTE FROM GE
	METER & INSTRU PANEL	10			4-15-85
	300 KVA X FORMER	2			GEO ECHON
	HV AIR SWITCH (600 AMP)	1			OKL.
	X-FORMER 13 8/480	2	EA		NO 3 41920
	TOTAL LAB & MATL				75,189
	TAXES & INSURANCE		7%		5263
				SUB TOTAL	80 452
	OVERHEAD		15%		12,068
				SUB TOTAL	92,520
	PROFIT		10%		9,252
				SUB TOTAL	101,772
	PRIME MARK UP		10%		10,177
				SUB TOTAL	111,949
	BOND		1%		1,119
	TOTAL EXTERIOR ELECTRICAL	TO SHT 2	4100 SF	@ 25.58	113,068
	OFFICIAL USE ONLY				

KSC FORM 31-224 10/74 — NASA/KSC AUG/76

Figure C-1. KSC Preliminary Cost Estimate Work Sheet, Unit Cost

APPENDIX D

CONSTRUCTION COST ESTIMATE
(CODE C-95)

COST ESTIMATE COVER SHEET

GOVERNMENT ESTIMATES ARE ADMINISTRATIVELY CONFIDENTIAL
ACCESSIBLE TO AUTHORIZED NASA/KSC PERSONNEL OR REPRESENTATIVES ONLY

PROJECT ORDNANCE BUILDING 4100 SF

LOCATION KSC - LC 39 - VAB AREA

IFB NO N/A

BID DATE N/A

AMENDMENT N/A

ESTIMATE CODE C 95

PCN 77406

CONTRACT W O 6005

DRAWING NO 79K67392 SHT 80

MODEL NO. N/A

NASA DD-FED-31
LEAD DESIGNER ALICE JONES - / K. L. GEORGE A&E

KSC COST ENGINEER JOE A. BROWN NASA

NASA DF FED-2
PROJECT ENGINEER D.R. RAINWOOD / K.B. FRENCH A&E

PREPARED BY J.B. SMITH ABE FRC KSC

FIRM/ADDRESS 1400 APOLLO BLVD. ROCKET CITY, UTAH

LOCATION UTAH

SUBMITTAL DATE MAY 1, 1985

ESTIMATED BY KOLB A&E VARNDELL FRC

PHONE NO. 305-867-2725

REVIEWED BY I. SEYMORE

APPROVED BY JUSTIN CASE

PHONE NO. 305-867-3994

Cost Estimating for procurement requires special handling in accordance with DE ID-1142.23, KSC SPEC-G-0002 and KSC SPEC-G-0003 for GSE.

OFFICIAL USE ONLY

KSC FORM 21-668 (3/83)

Figure D-1. Cost Estimate Cover Sheet

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☐ CONSTRUCTION

CODE: C-95	DATE COMPLETED: MAY 1, 1985	SHEET 2 OF 42 SHEET ____ OF ____	
PROJECT/B O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: C-1 THRU C-9
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC 2421	CHECKER: WRIGHT PRC 2421	APPROVED: JUSTIN CASE OF J.B. SMITH	

PROJECT SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL FROM	TOTAL COST
I SITE WORK						SHT	
2A DEMOLITION PAVING	610	SY	@	3.087		4	1,880
2E EARTH WORK	6500	CY	@	7.73		4	50,273
2P BIT PAVING	3100	SY	@	15.31		4	47,469
2T GRASSING	5600	SY	@	1.96		4	10984
2V STORM DRAINAGE	132	LF	@	104.97		4	13,856
SUB TOTAL							124,462
II BLDG STRUCT. TO 5'-0" LINE							
2.14 ARCH STRUCT	4100	SF	@	74.34		15	304,780
-15 MECHANICAL (INT)	4100	SF	@	2584		23	105,949
-16 ELECTRICAL (INT)	4100	SF	@	2486		29	101,923
SUB TOTAL	4100	SF	@	127.63			512,652
III UTILITIES OUTSIDE 5'-0" LINE							
15-F STEAM DISTRIBUTION	1,000	LF	@	34.72		35	34715
15-G SANITARY SEWERS	160	LF	@	3654		35	5,846
15-Y WATER SUPPLY	1014	LF	@	3731		35	37,831
16-A EXTERIOR ELEC	2,000	KVA	@	214.78		39	429,569
SUB TOTAL							507,961
IV SPECIALIZED CONSTRUCTION							
13F SPECIALIZED SYS. GN_2 $\frac{3}{4}$"304	50	LF	@	197.76		42	9,888
GFE-VALUE 3 $\frac{3}{4}$" VALVES @ $50,000	150,000						
EST CONST. BID COST	4100	SF	@	281.70			1,154,963
SPECIAL COND-ESCALATION	14	MO	@	1%/MO	=	14%	161,695
EST CONST BID COST W/ESCALATION							1,316,658
S&A DURING CONSTRUCTION	10%						131,666
CONTINGENCIES	10%						144,835
CURRENT COST ESTIMATE	4100	SF	@	41797			1,593,159

KSC FORM 21-245 (REV 4/80)

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Figure D-2. Construction Cost Estimate, Project Summary

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 2 OF 22 / SHEET ____ OF ____
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392 / SHEET NO: C-1 THRU C-9
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA		PCN: 77406 / PD/CCBD:
ARCHITECT OR ENGINEER: J. B SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL PIZC 2501	CHECKER: BLALOCK PRC 2421	APPROVED:

GENERAL CONDITIONS & OVERHEAD SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR ☐ FIELD TOTAL ☐ F&B	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
SUPERINTENDENT	13	WK	600	7800	100	1,300	
CONSTRUCTION ENGINEER	7	WK	500	3500	—	—	
QC-SAFETY ENGINEER	7	WK	300	2,100	—	—	
PAYROLL CLERK & TYPIST	.3	WK	300	3,900	—	—	
OFFICE TRAILER	3	MO	—	—	125	375	
OFFICE SUPPLIES	4	MO	—	—	30	120	
METERED WATER	4	MO	—	—	40	160	
METERED ELECTRICITY	4	MO	—	—	60	240	
PORTO LETS	4	MO	—	—	50	200	
GENERAL CLEANING	120	HR	9.25	1,110	—	—	
CFM-UPDATE ACTIVITIES	100	EA	10.00	1,000	—	—	
HOME OFFICE	4	MO	—	—	500	2,000	
TOOL SHED	1	EA	—	—	200	200	
OSHA INSPECTION	50	HR	10.00	500	—	—	
HAUL DEBRIS	24	HR	10.00	240	—	—	
PROJECT SIGN		A/R	—	—	100	100	
MOB & DEMOB	100	HR	12.00	1,200	—	—	
TOOLS & EQUIPMENT		A/R	—	—	380	380	
TRAVEL-TO HOME OFFICE	3	R/TRIP	—	—	200	600	
FIRST-AID EXPENSE	4	MO	—	—	30	120	
MISCELLANEOUS SUPPLIES		A/R	—	—	100	100	
TELEPHONES	4	MO	—	—	100	400	
SUBTOTAL				21350		6295	
FT&I AND SALES TAX			20%	4270	5	315	
				25,620		6610	32,230
32,230 ÷ 214798 = 15% OVERHEAD SEE SHT 15							
TOTAL EXPENSE ÷ LABOR & MATERIAL COST = OVERHEAD							
* SEE SHT 15							

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Figure D-3. Construction Cost Estimate, General Conditions and Overhead Summary

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 4 OF 42; SHEET C-1 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392 — SHEET NO: C-1 THRU C-9
STATION SET: — LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J.B SMITH INC.		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 1421	APPROVED:

SITE WORK ELEMENTS SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL	LABOR PAB	MATERIAL PER UNIT	MATERIAL TOTAL FROM	TOTAL COST
							SHT	
2A DEMOLISH EXIST PAVMT.	610	SY	@	3.08			5	1,880
2E EARTH WORK								
CLEAR & GRUB	3	AC						
EXCAVATION	2500	CY	6500	CY @		773	5	50,273
FILL (BORROW)	4,000	CY						
2P BITUMINOUS PAVING 256 TON	4350	SY	@	11.00			11	47,469
2T GRASSING	5600	SY	@	1.97			6	10,984
2V SITE STORM DRAINAGE	132	LF	@	104.97			7	13,856
TOTAL SITE WORK	4350	SY	@	28.70			-	124,462
TOTAL TO SHT 2							-	124,462
REF SHTS 8 THRU 10 FOR COMPUTATION								
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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 1 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 5 OF 42 SHEET C-2 OF
PROJECT/W O TITLE: ORD NANCE BUILDING LC39		DRAWING NOS: 79K67392 — SHEET NO: C-1 THRU C-9
STATION SET: — LOCATION: JOHN F KENNEDY SPACE CENTER, FLA		PCN: 77406 — PD/CCBS:
ARCHITECT OR ENGINEER: J.B. SMITH INC — **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL PRC2501	CHECKER: BLALOCK PRC 2421	APPROVED:

SITE WORK SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL	LABOR PAD	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
2A DEMOLISH EXIST PAVING	610	SY	1.25	763		.60	366	
PT&I AND SALES TAX			25%	191		5%	18	
SUB TOTAL				954			384	1,338
SUBCONTRACT OVERHEAD	15	%						20
							SUB TOTAL	1539
SUBCONTRACT PROFIT	10	%						154
							SUB TOTAL	1693
PRIME CONTRACT MARK-UP	.10	%						169
							SUB TOTAL	1862
BOND	1	%						19
TOTAL TO SHT 4	610	SY	@	3.08				1880
2E EARTH WORK								
CLEAR & GRUB	3	ACR	945	2835		600	1,800	
EXCAVATION	2,500	CY	1.34	3,350		1.20	3,000	
FILL BORROW	4,000	CY	2.50	10,000		2.50	10,000	
SUBTOTAL				16,185			14,800	
PT&I AND SALES TAX			25%	4,046		5%	740	
SUB TOTAL				20,231			15540	35,771
SUB CONTRACT OVERHEAD	15	%						5,366
							SUB TOTAL	41,137
SUBCONTRACT PROFIT	10	%						4,114
							SUB TOTAL	45,250
PRIME CONTRACT MARK UP	10	%						4525
							SUB TOTAL	49,775
BOND	1	%						498
	2500	CY	@	2011				50,273
TOTAL TO SHT 4								

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 2 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 6 OF 42; SHEET C-3 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392; SHEET NO
STATION SET; LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA		PCN: 77406; PD/CCBD
ARCHITECT OR ENGINEER: J B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED

SITE WORK CONT. SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
2T GRASSING							
SOD	20	SY	1.91	38	1.40	28	
SEED	1,500	SY	35	525	.15	225	
SEED & MULCH	5,600	SY	.40	2240	.20	1,120	
2" MARL WORKED IN	5608/311	SY/CY	.20	1,120	4.50	1,420	
SUBTOTAL				3923		2773	
PT&I AND SALES TAX			25%	981	5%	139	
SUBTOTAL				4,904		2,912	7816
SUBCONTRACT OVERHEAD	15%						1,172
						SUBTOTAL	8,988
SUBCONTRACT PROFIT	10%						899
						SUBTOTAL	9887
PRIME CONTRACT MARK-UP	10%						989
						SUBTOTAL	10,875
BOND	1%						109
TOTAL TO SHT. 4	5,600	SY	@	1.96			10,984

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 3 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 1 OF 42; SHEET C-4 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392 — SHEET NO: C-1 THRU C-9
STATION SET — LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED:

SITE WORK CONT. SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR ☐ FIELD ☐ TOTAL ☐ F&B	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
.2V SITE STORM DRAINAGE							
CONC CURB & GUTTER	335	L.F	3.50	1,173	350	1,173	
CONCRETE FLUME	1	EA	200	200	150	150	
BCCMP 24"ϕ	96	L.F	4.00	384	18.00	1728	
BCCMP 22" x 13"	36	LF	4.50	162	14.00	504	
CONC. HEADWALLS TYP C	6	EA	350	2100	175	1,050	
SUBTOTAL				4019		4605	
P&H AND SALES TAX			25%	1,005	5%	230	
SUBTOTAL				5024		4835	9859
SUBCONTRACT OVERHEAD	15	%					1479
						SUBTOTAL	11,338
SUBCONTRACT PROFIT	10	%					1,134
						SUBTOTAL	12,472
PRIME CONTRACT MARK-UP	10	%					1,247
						SUBTOTAL	13,719
BOND	1	%					137
TOTAL	132	LF	@	104.97			13,856

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 4 of 11)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 8 OF 42; SHEET C-5 OF
PROJECT/B O TITLE: ORDNANCE BUILDING LC 39		DRAWING NOS: 79K67392 SHEET NO: C-1 THRU C-9
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 77406 PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL FRC 2501	CHECKER: BLALOCK FRC 2421	APPROVED:

EARTH WORK SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR ☐ FIELD ☐ TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
2E UNCLASSIFIED EXCAVATION							
A ASSUMPTIONS							
1. TOTAL EXCAVATION FOR THREE BUILDINGS SITES WILL BE USED TO ESTABILISH A UNIT COST.							
2. SUB CONTRACTORS WILL HAVE A MINIMUM OF 4-TO 10 HOUR DAY TO COMPLETE TOTAL EXCAVATION.							
3. SIX(6) CY SCRAPERS WILL BE USED WITH 2-D8 DOZERS ONE AS A PUSHER & ONE AS A SPREADER							
B EQUIPMENT							
1. FOR ECONOMICAL OPERATION USE 3- 6CY SCRAPERS							
2 SCRAPER CAP.-ASSUME 600' HAUL CAP-71CY/HR (REF RSGE 62 TM 5-252)							
3 TIME REQUIRED = 3720/3x71x10 = 1.75 USE 2 DAYS							
C COST SUMMARY							
1. EQUIPMENT							
a. 3-6CY SCRAPERS	60	HR	—	—	15.25	915	
b. 2-D-8 DOZERS	40	HR	—	—	13.30	532	
c. 1- MAINT. TRUCK	30	HR	—	—	3.52	106	
2 LABOR							
a. SCRAPER OPERATOR	60	HR	15.85	951	—	—	
b. DOZER OPERATOR	40	HR	15.85	634	—	—	
c. OILER	20	HR	12.22	244	—	—	
3 MOB & DEMOB							
a SCRAPERS	3	EA	—	—	100	300	
b DOZERS	2	EA	—	—	125	250	
SUB TOTAL TO SHT.				1,829		2,103	

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 5 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C-95	DATE COMPLETED: MAY 1, 1985	SHEET 9 OF 42 SHEET C-6 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO:S 79K67392	SHEET NO C-1 THRU C-9
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN 77406	PD/CCBC
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO 6005	
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED	

EARTHWORK SUMMARY

	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR ☐ FIELD ☐ TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
2E BORROW (FILL)							
A ASSUMPTIONS							
1. 1-2 CY. DRAG LINE WILL BE USED AT THE BORROW PIT.							
2. HAUL DISTANCE = 5-MILE							
3 12 CY. DUMP TRUCKS WILL BE USED FOR HAULING.							
4. TOTAL QUANTITY OF BORROW FOR 3-BLDG SITES WILL BE USED IN ESTABLISHING A UNIT PRICE.							
5. CONTRACTOR WILL WORK A- 10-HR-DAY.							
B EQUIPMENT							
1. DRAG LINE CAPACITY.							
ASSUME EFF FACTOR = .80							
BUCKET FACTOR = .80							
CYCLE TIME = 33 SEC							
CAPACITY 2 X .80 X .80 X 3600 ÷ 33 = 140 CY/HR (140 X 10 HR-DAY = 1400)							
2. NO. DAYS REQ'D = 10 900/1400 = 7.8 USE 8 DAYS							
3. NO TRUCKS REQ'D (ASSUME WORKING CAP: 11 CY.)							
a CYCLE TIME							
LOADING TIME = (11/440) 60 = 5 MIN.							
TRAVEL TIME = 10 MI @ 30 MPH = 30 MIN							
LOADING TIME = 5 MIN							
TOTAL = 40 MIN.							
b TRIPS/HR = 60/40 = 1.5							
c NO TRUCKS = 140/1.5X11 = 8.5 USE 9 TRUCKS							
4. OTHER EQUIPMENT 1	D-8 DOZER 1-ROLLER 1 MAINT TRUCK						
1	GRADER 1-SPRINKLER TRUCK						

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 6 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE	DATE COMPLETED	SHEET / OF
C 95	MAY 1, 1985	SHEET 10 OF 42 SHEET C7 OF

PROJECT/B O TITLE	DRAWING NOS	SHEET NO
ORDNANCE BUILDING LC 39	79K67392	

STATION SET	LOCATION	PCN	PD/CCBC
	JOHN F. KENNEDY SPACE CENTER, FLA	77406	

ARCHITECT OR ENGINEER	WORK ORDER OR CONTRACT NO
J. B SMITH INC.	6005

ESTIMATOR	CHECKER	APPROVED
VARNDELL PRC2501	BLALOCK PRC2421	

EARTH WORK SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ ☐ FIELD ☐ FAB) PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
2E BORROW CONTINUED							
C COST SUMMARY							
1. EQUIPMENT							
A 1-2 CY DRAGLINE	80	HR	—	—	15.80	1,264	
B 9-12 CY DUMP TRUCK	720	HR	—	—	10.35	7,452	
C 1-D8 DOZER	80	HR	—	—	13.35	1,068	
D 1- GRADER	80	HR	—	—	15.25	1,220	
E 1- ROLLER	80	HR	—	—	6.15	492	
F 1- MAINT. TRUCK	80	HR	—	—	3.51	281	
G 1- SPRINKLER TRUCK	80	HR	—	—	4.02	322	
2 LABOR							
A DRAGLINE OPERATOR	80	HR	17.37	1,390	—	—	
B DOZER	80	HR	15.85	1,268	—	—	
C GRADER	80	HR	15.85	1,268	—	—	
D ROLLER	80	HR	13.21	1,057	—	—	
E DUMP TRUCK	720	HR	15.18	10,930	—	—	
F TRUCK DRIVERS	160	HR	15.18	2,429	—	—	
G LABORERS	160	HR	10.20	1,632	—	—	
H OILER	80	HR	12.26	981	—	—	
I MECHANIC	80	HR	17.37	1,390	—	—	
J FOREMAN	80	HR	20.69	1,655	—	—	
3 MOB & DEMOB							
A DRAGLINE	1	EA	—	—	350	350	
B DOZER	1	EA	—	—	150	150	
C GRADER	1	EA	—	—	100	100	
D ROLLER	1	EA	—	—	150	150	
SUB TOTAL TO SHT.				24000		12,849	

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 7 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C-95	DATE COMPLETED: MAY 1, 1985	SHEET 1 OF 42 SHEET C-8 OF	
PROJECT/W O TITLE: ORDINANCE BUILDINGS LC 39		DRAWING NO(S): 79K67392	SHEET NO: C-1-THRU-C-9
STATION SET / LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.		PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: JOHN B SMITH, INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BIALOCK PRC 2421	APPROVED:	

FLEX PAVEMENT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR ($ [redacted]) FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	FROM SHEET
2P BITUMINOUS PAVING							
A STABILIZATION							
1 MATERIAL	332	CY	-	-	12.50	4,150	2
2. PROCESSING	4350	SF	.40	1,740	-	-	
B LIMEROCK BASE 6"	3,100	SY	.40	1240	4.35	13,485	13
C BITUMINOUS PAVING							
1. BITUMINOUS CONC	256	TON	4.50	1,152	33.00	8,448	14
2 BITUMINOUS TACK COAT	930	GAL	.07	65	1.07	977	14
D TRAFFIC STRIPES	680	LF	.08	54	.04	27	14
TOTAL				4,251		27,107	
PT&I AND SALES TAX			25%	1,063	5%	1,355	
				5,314		28,462	33,776
OVERHEAD	15	%					5,066
						SUBTOTAL	38,842
PROFIT	10	%					3884
						SUBTOTAL	42,726
PRIME MARK UP	10	%					4,273
						SUBTOTAL	46,999
BOND	1	%					470
TOTAL FLEXIBLE PAVEMENT	4350	SY	@	11.00	TOTAL TO SHT-2		47,469

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 8 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 12 OF 42 SHEET C9 OF	
PROJECT/W O TITLE: ORDINANCE BUILDING LC 39		DRAWING NOS: 79K67392	SHEET NO: G1 THRU G9
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL RC2501	CHECKER: BLALOCK RZC 2421	APPROVED	

FLEXIBLE PAVING SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL TO SHEET
FLEXIBLE PAVING							
BACK UP DATA							
1. OCALA LIME ROCK	1	CY	-	-	680	680	
2. TRUCK HAUL	25	MI	-	-	.20	500	
3. UNLOAD & SPREAD	1	CY	-	-	.20	.20	
4. COMPACT & SHAPE	1	CY	-	-	.50	.50	
[BASED ON 20CY TRUCK]							
COST PER CY @ SITE	1	CY	-	-	-	12.50	11
STABILIZATION QUANITY							
1 3" UNDER ROADWAY		$\frac{3}{12}$ x	$\frac{9}{1}$ x	$\frac{3100\,SY}{27\,CY}$	=	258CY	
2. 3" STABIL SHOULDERS		$\frac{3}{12}$ x	$\frac{9}{1}$ x	$\frac{1250}{27CY}$	=	104CY	
		362	x	120%	COMPACTION		Loss=435
TOTAL STABILIZATION	435	CY	-	-	12.50	5438	
TOTAL PROCESSING							
1,250 + 3,100	4,350	SY	.40	1,740	-	-	
						—	
SUBTOTAL				1,740		5,438	

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 9 of 11)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C 96	DATE COMPLETED: MAY 1, 1985	SHEET 13 OF 42; SHEET C-10 OF
PROJECT/W O TITLE: ORDINANCE BUILDING LC 39		DRAWING NO(S): 79K67392 — SHEET NO: C1-THRU-C9
STATION SET / LOCATION: JOHN F KENNEDY SPACE CENTER, FLA		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED:

FLEXIBLE PAVEMENT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
BI LIME ROCK BASE COST							
1. LIME ROCK FOR RT/TON					4.50	4.50	
2 FREIGHT TO TUSVILLE					3.70	3.70	
3. UNLOAD / TON					.30	.30	
4. TRUCK HAUL/TON	25	MI	-	-	.20	5.00	
TOTAL COST PER TON @ SITE						13.50	
BII LIME ROCK BASE-QUANITY							
1. 6" BASE MATERIAL	6/12 x 9/27	x 3100	x 125% =		645 COMPACTION LOSS		
2. COST PER SY	645/2000	x	13.50			4.35	
3 PROCESSING COST	1	SY		.40			
SUBTOTAL TO SHT. 11	1	SY		.40		4.35	4.73

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 10 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C95	DATE COMPLETED: MAY 1, 1985	SHEET 10 OF 42 SHEET C 11 OF	
PROJECT/WO TITLE: ORDINANCE BUILDING LC 39		DRAWING NOS: 79K67392	SHEET NO
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA		PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC 2501	CHECKER: WRIGHT PRC 2421	APPROVED	

FLEXIBLE PAVEMENT SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL	LABOR FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
C I BITUMINOUS CONCRETE COST								
1. MATERIAL TON TO SITE	1	TON	—	—		33.00	33	WWG
2 PROCESSING	1	TON	4.50	4.50		—	—	
TOTAL COST TO SHT. 11	1	TON		4.50			33	37.50
C II BITUMINOUS CONCRETE-QUANTITY.								
1. BITUMINOUS CONCRETE								
1.5 x 110 x 3100 ÷ 2000 =	256	TON	4.50	1152		33.00	8448	TO SHT. 11
2. BITUMINOUS TACK COAT								
3 x 3,100	930	GAL	.07	65		1.05	977	TO SHT 11
D TRAFFIC STRIPES	680	LF	.08	54		.04	27	TO SHT. 11

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Figure D-4. Construction Cost Estimate, Site Work Elements Summary (Sheet 11 of 11)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 15 OF 42 SHEET S-1 OF
PROJECT/W O TITLE: ORDINANCE BUILDING LC 39		DRAWING NO'S: 79K67392
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 77406
ARCHITECT OR ENGINEER: J.B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARUDELL PIC 2501	CHECKER: BLALOCK PIC 2421	APPROVED

ELEMENT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS.	LABOR ($[redacted]) PER UNIT	LABOR ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL SHT.
OF ARCH/STRUCT							
1. GENERAL REQUIREMENTS	SEE OVERHEAD FOR BACK UP DATA						16
2 SITE WORK	196	CY	11.01	2,158	9.80	1921	16
3 CONCRETE	207	CY	102.73	21,266	109.95	22,759	16-17
4 BRICK & BLOCK MASON	9600	SF	1.28	12,324	1.03	9894	17
5 METALS STRUC, MISC.	20,753	LB	.60	12,496	.84	17,434	18
6 CARPENTRY	260	BF	.50	130	.40	104	19
7 MOISTURE PROTECTION	4100	SF	2.70	11,089	3.14	12,944	19
8 DOOR-WINDOW & GLASS	384	SF	11 37	4,366	1889	7,255	20
9 FINISHES	21,343	SF	.28	5927	.25	5,369	21
10 SPECIALTIES	NIC	—	—	—	—	—	—
11 EQUIPMENT	NIC	—	—	—	—	—	—
12 FURNISHINGS	NIC	—	—	—	—	—	—
13 SPECIAL CONSTRUCTION	NIC	—	—	—	—	—	—
14 CONVEYING SYS.	15	TON	1903.20	28,623	2597.87	32,398	22
SUBTOTAL				98,379		110,078	
P&I AND SALES TAX			25%	24,593	5%	5504	
				122,966		115,582	238,548
OVERHEAD	15	%					35,782
							274,330
PROFIT	10	%					27,433
							301,763
BOND	1	%					3017
SUB TOTAL	4100	SF	@	7,434			304,780
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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 1 of 8)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 16 OF 42 SHEET 52 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392 — SHEET NO: C 1-THRU-C 9
STATION SET: — LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: VARNDELL REC 2501	CHECKER: BLALOCK REC 2421	APPROVED:

ARCH & STRUCT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS.	LABOR ($ ☐ FIELD ☐ FAB) PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
1. GENERAL REQUIREMENTS							
C CLEAN UP							
D LAY OUT							
TOTAL	SEE OVERHEAD SHT FOR BACK UP DATA						SHT-3
2. SITEWORK							
D EXCAVATION ½ HAND	89	CY	8.50	757	1.20	107	
BACKFILL-COMPACTION	107	CY	4.55	487	.60	64	
FILL-SELECT-UNDER SLAB	500	CY	1.50	750	3.50	1,750	
FINE GRADING	4,100	SF	.04	164	—	—	
SUB TOTAL				3,158		1,921	
3 CONCRETE							
A FORM WORK							
FOOTING FORMS	800	SF	1.55	1240	.78	624	
STRUCTURAL FORMS	5,450	SF	1.55	8,447	.78	4251	
SLAB FORMS	80	SF	1.66	133	.78	62	
BOND BEAM FORMS	318	SF	1.80	562	1.14	356	
B REINF. MATERIALS							
REINF. BARS SIZE #3-#6	8,850	LB	.25	2213	.30	2655	
MESH 6X6 6/6	4,500	SF	.15	675	.12	540	
C CONCRETE							
EXPANSION JOINT ½X6	300	LF	.39	117	.45	135	
FOOTING 3,000#	32	CY	15.00	480	45.00	1,440	
STRUCTURAL 3,000#	85	CY	15.00	1275	45.00	3825	
FLOOR SLAB 3,000#	80	CY	15.00	1200	45.00	3600	
BOND BEAMS 3,000#	10	CY	20.00	200	45.00	450	
CRANE, BUCKET OR PUMP	95	CY	5.00	475	10.00	950	
SUB TOTAL TO SHT 17				18,425		18,888	

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 2 of 8)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C95	DATE COMPLETED: MAY 1, 1985	SHEET 17 OF 76 SHEET 3-3 OF	
PROJECT NO TITLE: ORDNANCE BUILDING LC39		DRAWING NO'S: 79K67392	SHEET NO: C1THRUC-9
STATION SET	LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC2501	CHECKER: BLALOCK PRC2421	APPROVED	

ARCH STRUCT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS.	LABOR ($) PER UNIT	LABOR ($) FIELD TOTAL / PAR	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
3 CONCRETE FROM SHT	16			18,425		18,888	
A FINISH SLABS							
SCREED	540	SF	.05	27	.05	27	
TROWEL	4,100	SF	.10	410	.05	205	
CURING	4,100	SF	.13	533	.10	410	
HARDNER	4,100	SF	.14	574	.10	410	
D PRECAST GYP ROOF DECK							
GYPSUM-ON-1" INSULFORM	3240	SF	.40	1,296	.87	2,819	EAST COAST
TO SHT 15 SUBTOTAL	207	CY	102.73	21,265	109.95	22,759	
E BRICK-BLOCK MASONRY							
A. ERECT MASONRY WALLS							
8"x8"x16" CONC BLOCK	790	EA	1.10	869	.63	498	DIXIE CONC
* 4"x8"x16" CONC BLOCK	9,742	"	.96	9352	.50	4871	DIXIE CONC
12"x8"x16" CONC BLOCK	374	EA	1.40	524	.92	344	DIXIE CONC
HORIZ. BLOCK REINF	7,300	LF	.05	365	.07	511	
MORTAR	31	CY	20.	620	55	1705	
CLEAN & POINT	9,600	SF	.05	480	.20	1920	
SPLASH BLOCK	3	EA	8.00	24	15.00	45	
TO SHT 15 SUBTOTAL	9600	SF	1.28	12,324	1.03	9894	
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* LABOR ANALYSIS	4"x8"x16"						
BASED ON (1) CREW LAYING 600 BLOX PER DAY							
3 MASON @ 13.87	332.88						
2 HELFER @ 10.20	244.80						
TOTAL	577.18						
577.18 ÷ 600 = 96							

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 3 of 8)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 18 OF 42 SHEET S-4 OF	
PROJECT/WO TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67892	SHEET NO: C1-THRU-C9
STATION SET	LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PEC 2501	CHECKER: BLALOCK PEC 2421	APPROVED	

ARCH-STRUCT SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
5 METALS-STRU-MISC							
C-STEEL BAR JOIST MATERIAL	9,320	LB	-	-	.35	3262	
BAR JOIST FAB	9,320	LB	.25	2330	.05	466	
BAR JOIST ERECT.	9,320	LB	.30	2795	.15	1398	
D-STRUCTURAL STEEL PURCHASE							
TRUSSES-MISC. WAREHOUSE	2250	LB	—	-	.35	788	SEE STEEL
* BEAMS MILL	5221	LB	-	-	.40	2088	BREAKDOWN
COLUMNS MILL	2610	LB	-	-	.35	914	F 5
** SHOP FABRICATION COST							
TRUSSES & MISC.	2250	LB	.30	675	.15	338	
BEAMS	5,221	LB	.30	1,566	.25	1,305	
COLUMNS	2,610	LB	.30	783	.15	392	
ERECTION COST	10,081	LB	.30	3024	.25	2520	
CRANE RENTAL	40	HR	20.00	800	70.00	2800	
** CONSISTS OF ENG DWGS		—	-	-	-	-	
EQUIP-SHOP LABOR & TRANSP		-	-	-	-	-	
K-MISC. METALS							
FURN. & ERECT ASCE RAILS	142	LF	1.50	213	5.50	781	
FURN.-SET ANCHOR BOLTS	40	EA	1.50	60	.75	30	
FURN-PLACE AW L'S	500	LB	.50	250	.70	350	
SUB TOTAL TO SHT. 15	20,753	LB	.60	12,496	.84	17,432	
*TYPICAL BREAK DOWN FOR BEAMS							
REF APPENDIX "B" FOR BREAK DOWN EACH ITEM.							

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 4 of 8)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 19 OF 42 SHEET 2-5 OF	
PROJECT/WO TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: C1-THRU-C9
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED	

ARCH-STRUCT SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR FIELD TOTAL	LABOR PAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
6 CARPENTRY								
A ROUGH CARPENTRY								
BUILD & PLACE-TREATED	260	BF	.50	130		.40	104	
SUBTOTAL				1.30			1,04	
7 MOISTURE-PROTECTION								
A BUILT UP ROOF								
BUILT UP 5-PLY T & G	38	SQ	40.00	1,520		75.00	2850	WEIDMAN
INSUL. WALL 2" FIBERGLASS	4,100	SF	.20	820		.65	2665	EAST COAST
INSUL ROOF 1½" RIGID FIBER	38	SQ	17.00	646		42.00	1,596	B.F SUPPLY
B SHEET METAL								
MISC FLASHING COPPER 16oz	76	SF	.85	65		1.65	125	
LOW GRAVEL STOP 4" ALUM	174	LF	1.13	196		2.70	470	
FACIA ALUM. .032	82	LF	1.22	100		3.10	254	
7X5 GUTTER ALUM	120	LF	1.37	164		1.00	120	
6X5 DOWN SPOUT ALUM	104	LF	1.60	166		1.50	156	
4X4 DOWN SPOUT	12	LF	1.17	14		1.12	13	
E MEMBRANE WATER PROOF								
VAPOR BARRIER - POLY	3,780	SF	.15	567		.25	945	WEIDMAN
MEMBRANE W.P 3-PLY FELT	4,100	SF	.35	1435		.50	2,050	
BITUMEN V WALL BAR	4,100	SF	1.08	4428		.06	246	
H CAULKING - SEALING								
NEOPRENE GASKET	620	LF	.82	508		1.90	1,178	McMASTER
POLYSULFIDE ½ X ¼	400	LF	1.15	460		.69	276	McMASTER
SUBTOTAL TO SHT. 15	4,100	SF	2.70	11,089		3.14	12,944	

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 5 of 8)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 20 OF 42 SHEET 5-6 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC39		DRAWING NO.S: 79K67392	SHEET NO
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.	PCN: 77406	PD·CCBC
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED	

ARCH-STRUCT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS.	LABOR ($[redacted]) PER UNIT	LABOR ($[redacted]) ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
8 DOORS-WINDOWS-GLASS							
G ALUMINUM DOOR							
HM. 6'x7' DOUBLE W/FRAME	1	PR	95.00	95	602.	602	ENDURA LIFE
HM 3'x7' SINGLE W/FRAME	2	EA	60.00	120	325.	650	
VERTICAL LIFT DR. 3(10'x10')	300	SF	6.50	1950	8.50	2550	MAHON
DOUBLE BUCK	1	EA	50.0	50	60	60	
SINGLE BUCK	2	EA	35.0	70	45	90	
F BUILDERS HARDWARE							
BUTTS T2152 US28	3	PR	10.0	30	24	72	
PANIC BOLTS 810K	2	EA	50	100	290	580	
CLOSER 300 1V	2	EA	18.50	37	55	110	
BUTTS T2112 US28	3	PR	10.	30	24	72	
LOCK SET 161 B4	1	EA	16.	16	50	50	
FOOT BOLT F1023 BC6	1	EA	5.	5	5	5	
CHAIN BOLT F1023 AC6	1	EA	6.	6	3	3	
CUT PLACE WEATHERSTRIP	20	LF	1.25	25	6.15	123	
SET THRESHOLD	6	LF	4.50	27	4.05	24	
INFLATABLE SEAL	150	LF	12.0	1800	15.00	2250	
PAD LOCKS EPC	3	EA	1.50	5	4.50	14	
SUBTOTAL TO SHT. 15	384	SF	11.37	4,366	18.89	7255	

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 6 of 8)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE	DATE COMPLETED	SHEET 21 OF 42 SHEET 41 OF
C 95	MAY 1, 1985	

PROJECT/W O TITLE	DRAWING NO(S)	SHEET NO
ORDNANCE BUILDING LC 39	79K67392	C1-THRU C9

STATION SET	LOCATION	PCN	PD/CCBD
	JOHN F. KENNEDY SPACE CENTER, FLA.	77406	

ARCH TECT OR ENGINEER	WORK ORDER OR CONTRACT NO
J.B SMITH INC	6005

ESTIMATOR	CHECKER	APPROVED
VARNDELL RC 2501	BLALOCK RC 2421	

ARCH-STRUCT SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR ($ [redacted]) PER UNIT	LABOR ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
9 FINISHES							
A PAINTING FINISHING							
METAL WORK	102	LF	.25	26	.95	97	
EXT-BLOCK-CONCRETE	7,376	SF	.22	1,623	.12	885	
INT-WALLS-CEILING	10,865	SF	.20	2,173	.10	1087	
STRUCT STEEL-INORG	1,500	SF	.30	450	.50	750	
ZINC 2-COAT							
BAR JOISTS-INORG	1,500	SF	.30	450	.50	750	
ZINC 2-COAT							
SAND BLAST							
STRUCT STEEL	1500	SF	.40	600	.60	900	
BAR JOISTS	1,500	SF	.40	600	.60	900	
SUBTOTAL	21,343	SF	.28	5922	.25	5,369	
10 SPECIALTIES	NIC						
11 EQUIPMENT	NIC						
12 FINISHES	NIC						
13 SPECIAL CONST.	NIC						

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 7 of 8)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 22 OF 42 SHEET 38 OF	
PROJECT/B O TITLE: ORDNANCE BUILDING LC39		DRAWING NO(S): 79K67392	SHEET NO: C1-THRU-C9
STATION SET:	LOCATION: J.F.KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B.SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC 2501	CHECKER: BLALOCK PRC 2421	APPROVED:	

ARCH-STRUCT SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ [redacted]) PER UNIT	LABOR ($ [redacted]) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
14 CONVEYING SYSTEM							
1 ELEC. OVERHEAD CRANE	15	TON					
BRIDGE W12 x 19 x 40' E-E	1,800	LB	.60	1080	1.40	2520	
HOIST DRUMS 3/8" 207-1 KEY ELEC	1450	EA	.52	750	10.	14,500	RANCO 8/24*
HOIST DRUM MTR 10HP A/C 2SP	800	LB	.688	550	688	5,500	
1800/600 RPM KOWOL ELEC Co							
GEAR REDUCER 900-1	125	LB	60	750	680	850	
TROLLEY MOTOR 5HP A/C	200	LB	4.25	850	8.50	1,700	KEY ELEC
BRIDGE MOTOR 5HP A/C	200	LB	5.00	1,000	9.25	1850	KEY ELEC
WIRING	500	LF	.75	375	3.50	1,750	
MANUFACTURING	100	HR	35	3500	-	-	
STEEL ERECTION	4650	LB	.60	2,790	.40	1,860	
MISC. STEEL	450	LB	.50	225	1.40	630	
ENGINEERING (6-SHEET)	250	HR	35.0	8,750	-	-	
INSTALL 7-MAN CREW 6-DAY	350	HR	22.65	7,930	-	-	
WIRE ROPE 7-19 3/4	400	LF	1.50	600	2.57	1,028	
TO ENT. 15 SUB TOTAL	15	TON	1908.2	28,623	2159.87	32,398	61,021
* RANCO 8-24-84							
CLEVELAND, OHIO							
216-692-04070							
15 TON ELEC. OVERHEAD CRANE INSTALLED					QUOTE	60,000	

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Figure D-5. Construction Cost Estimate, Architectural/Structural Summary (Sheet 8 of 8)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C95	DATE COMPLETED: MAY 1, 1985	SHEET 23 OF 42 SHEET M-1 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67892	SHEET NO
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J.A. BROWN DD-FED	

ELEMENT SUMMARY MECHANICAL INTERIOR	QUANTITY NO. UNITS		LABOR (MH) FIELD / SHOP / TOTAL	MATERIAL PER UNIT	MATERIAL FROM SHEET	TOTAL COST
15A PLUMBING	14	FIXTURES	1115.00		24	15,610
15C AIR COND. & HEATING	20	TON	3680.00		26	73,600
15M COMPRESSOR AIR SYS	5	OUTLETS	1240.60		27	6,203
15R VENTILATION	4	PRV	263400		28	10,536
TOTAL INTERIOR MECHANICAL	4,100	SF	25.84		2	105,949

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Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 1 of 6)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C.95	DATE COMPLETED: MAY 1, 1985	SHEET 24 OF — SHEET M-2 OF —	
PROJECT/W O TITLE: ORDNANCE BUILDING LC39		DRAWING NO(S): 79K67392	SHEET NO: M-2 THRU M-7
STATION SET:	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.	PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J B SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J.A. BROWN DD-FED	

MECHANICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15 A PLUMBING				OFFICIAL USE ONLY			
3"C.I. SOIL PIPE	25	LF	.17	4.3	3.27	82	HUGHES
3"C.I. COMBINATION-Y	1	EA	2.0	2.0	11.92	12	
3"C.I. 1/8" BEND	2	EA	1.5	3.0	9.64	19	
3"C I P-TRAP	2	EA	3.0	6.0	9.69	19	
3"C.I FLOOR DRAIN	2	EA	2.0	4.0	54.94	110	
24"x5' DRY WELL	1	EA	8.0	8.0	137.50	138	
ELEC. WATER COOLER 30 GAL	1	EA	6.0	6.0	568.70	569	
3/4" GALV. PIPE SCH. 40	60	LF	.19	11.4	1.10	66	
1" GALV. PIPE SCH. 40	170	LF	.20	34.0	1.47	250	
3/4" GALV. ELBOW	10	EA	.24	2.4	.96	10	
1" GALV. ELBOW	2	EA	.28	.6	1.96	4	
1"x1"x 3/4" RED TEE	3	EA	.42	1.3	3.22	10	
081-0215 WATER CLOSET	6	EA	8.0	48.0	550.67	3304	
1-194 CRANE LAVATORY	4	EA	5.0	20.0	176.00	704	
161-1000 ELJER URINAL	2	EA	8.0	16.0	306.65	613	
248-0155 ELJER SERVICE SINK	1	EA	8.0	8.0	276.80	277	HUGHES
TOTAL				175.0		6,187	843-9100
LABOR HOURS x RATE	175	HR	21.08	3,689			ORL
PT&I AND SALES TAX		%	25	922	5	309	
TOTAL				4611		6496	11,107
OVERHEAD	15	%					4,666
						SUBTOTAL	12,773
PROFIT & PRIME MARK UP	10-10	%					2,682
						SUBTOTAL	15,455
BOND	1	%					155
						SUBTOTAL	15,610
TOTAL PLUMBING TO SHT 23	14	FIXT		1,115.00			15,610

KSC FORM 21-243 (REV 4/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 2 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 25 OF 42 SHEET M-3 OF	
PROJECT/WO TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: M-2 THRU M 7
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J B. SMITH INC	CHECKER: KURVIN J B. SMITH	APPROVED: J A BROWN DD-FED	

MECHANICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15 C AIR CONDITIONING & HEATING				OFFICIAL USE ONLY			
A/C COMPRESSOR 20 TON	1	EA	24.0	24.0	4026	4,026	MCQUAY
25 HP MOTOR	1	EA	8.0	8.0	1065	1,065	"
STARTER	1	EA	4.0	4.0	310	310	
LIQ. RECEIVER W/FREON	1	EA	16.0	16.0	1042	1,042	
AIR COOLED CONDENSER	1	EA	16.0	16.0	8206	8206	"
AIR HANDLING UNIT WITH	1	EA	40.0	40.0	4987	4987	MC QUAY
HEATING & COOLING DX COILS							628-4825 DILL
3/4" PIPE GALV SCH 40	40	LF	.19	7.6	1.10	44	HUGHES
1" PIPE GALV SCH 40	40	LF	.20	8.0	1.47	59	843-9100
1/2" COPPER TUBING	10	LF	.05	.5	.48	5	"
3/4" ELL 90° SCH 40	4	EA	.24	1.0	.96	4	
1" ELL 90° SCH 40	4	EA	.28	1.1	1.96	8	HUGHES
1" GATE VALVE 150# BRONZE	1	EA	.96	1.0	59.73	60	SYSTEM COMPONENT
3/4" GATE VALVE 150# BRONZE	1	EA	.96	1.0	53.17	53	783-1002
REFRIGERANT	1	BTBL	8.0	8.0	594.59	595	423-0684 TOM CLEMENTS
DUCT WORK - GALV.	2433	LB	.087	211.7	1.25	3,041	AMERICAN METAL CO
DUCT WORK - ALUM	500	LB	.26	130.0	2.75	1,375	NORTHERN 295-7221
DUCT - 1" FIBERGLASS LINED	3100	SF	.034	105.4	.356	1,104	
GRILLS W/VOL CONTROL							R & R
10" x 24" ALUM	4	EA	1.0	4.0	37.11	148	849-0660
6" x 18" ALUM	5	EA	.5	2.5	28.12	141	
4" x 12" ALUM	5	EA	.5	2.5	23.25	116	
CEILING DIFFUSERS W/VOL CONT							AMERICAN METAL CO 254-7369
12" DIA ALUM	4	EA	1.0	4.0	15.40	62	
16" DIA ALUM	4	EA	1.0	4.0	65.45	262	
24" DIA ALUM	5	EA	1.0	5.0	115.50	578	
TOTALS TO SHT. 26				605.3		29,291	

KSC FORM 21-243 (REV 6/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 3 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 26 OF 42 SHEET M4 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC39		DRAWING NO(S): 79K67392	SHEET NO: M16 THRU M20
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J B. SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J.A. BROWN DD-FED	

MECHANICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15C A/C & HEATING CONTINUED				OFFICIAL USE ONLY			
24" x 36" R.A. GRILLS ALUM	4	EA	2.5	10.0	76.04	304	R & R
28" x 30" LOUV. M.O PAL	1	EA	4.0	4.0	76.04	76	"
THERMOSTAT T-651A	2	EA	1.0	2.0	53.90	108	HONEYWELL
RELAY	4	EA	1.0	4.0	133.10	532	894-3131 ORL
MOTORIZE DAMPER 24"x10'	2	EA	1.5	3.0	269.50	539	R & R
CONTROL WIRE	600	LF	.02	12.0	.07	42	849-0660 ORL
1" INSUL. FIBERGLASS PIPE	40	LF	.09	3.6	.94	38	NORTH
3/4" INSUL. FIBERGLASS PIPE	40	LF	.09	3.6	.88	35	BROS
MISC. HARDWARE	100	EA	.15	15.0	2.09	209	295-9221
CRANE RENTAL-10 TON	1	EA	16.0	16.0	470.	470	ORL
TEST & ADJUST SYS.	1	EA	40.0	40.0	200.	200	
TOTAL THIS SHT.				113.2		2,553	
TOTALS FROM SHT 25				605.3		29,291	
				718.5		31,844	
LABOR HOURS x RATE	718.5	HR	21.08	15,146			
PT&I AND SALES TAX		%	25	3,787	5	1,592	
				18,933		33,436	52,369
OVERHEAD	15	%					7,855
						SUBTOTAL	60,224
PROFIT	10	%					6,022
						SUBTOTAL	66,246
PRIME MARK-UP	10	%					6,625
						SUBTOTAL	72,871
BOND	1	%					729
TOTAL A/C & HEATING	20	TON		3,680	TO SHT 23		73,600

KSC FORM 21-263 (REV 6/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 4 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE	DATE COMPLETED	SHEET / OF
C 95	MAY 1, 1985	SHEET 27 OF 42 SHEET M-5 OF

PROJECT/B O TITLE	DRAWING NO(S)	SHEET NO
ORDNANCE BUILDING LC 39	79K67392	M-21 M-23

STATION SET	LOCATION	PCN	PD/CCBD
	JOHN F. KENNEDY SPACE CENTER, FLA	71406	

ARCHITECT OR ENGINEER		WORK ORDER OR CONTRACT NO
J.B. SMITH INC	**OFFICIAL USE ONLY**	6005

ESTIMATOR	CHECKER	APPROVED
KOLB J.B. SMITH INC	PURVIS J B SMITH INC	J.A. BROWN DD-FED

MECHANICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ([redacted] MH) PER UNIT	LABOR ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15 M COMPRESSOR AIR SYS.	1	EA	560	56.0	1376	1,376	WORTHINGTON
AIR COMPRESSOR W/20GAL RECEIVER							295-2641
CONTROLS & SAFETY DEVICES							ORC.
3/8" BRASS PIPE	10	LF	.19	1.9	.60	6	HUGHES
1/2" COPPER TUBE-TYPE "L"	90	LF	.12	10.8	.49	44	
1/2" C x 3/8" FIP TEE	2	EA	.39	.8	1.43	3	
1/2" C x 3/8" FIP ELL	1	EA	.28	.3	1.40	1	
1/2" C x C FIP ELL	10	EA	.28	2.8	1.54	15	
3/8" BRASS UNION	3	EA	.20	.6	1.32	4	
1/2" COPPER UNION	1	EA	.28	.3	153	2	
1/2" C x MI ADAPTER	1	EA	.25	.3	1.54	2	HUGHES
1/2" AIR VALVE	1	EA	.38	.4	62.21	62	SYSTEM
3/8" SOLENOID VALVE	3	EA	.38	1.1	95.21	286	COMPONETS
1/2" OUTLETS W/FILTERS	5	EA	.38	1.9	45.29	226	
1/2" CHECK VALVE	1	EA	.38	.4	58.08	58	
3/8" PRESS. RED. VALVE	1	EA	.38	.4	86.22	86	
1/2" HANGERS	10	EA	.25	2.5	1.25	13	78$-.00C
SUB TOTAL				80.5		2,184	
LABOR HOURS x RATE	80.5	HR	21.08	1697			
PT&I AND SALES TAX		%	25	424	5	109	
SUB TOTAL				2121		2293	4414
OVERHEAD	15	%					662
							5076
PROFIT & PRIME MARK UP	10-10	%					1,066
							6,142
BOND	1	%					61
TOTAL COMP AIR SYS.	5	OUTLETS		1240.60	TO SHT 23		6203

KSC FORM 21-263 (REV 4/80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 5 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 28 OF 42; SHEET M-6 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC39		DRAWING NO(S): 79K67392 SHEET NO: M24 M27
STATION SET:	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.	PCN: 77406 PD/CCBD:
ARCHITECT OR ENGINEER: J.B SMITH INC	**OFFICIAL USE ONLY**	WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: KOLB J.B SMITH INC	CHECKER: PURVIS J.B SMITH INC	APPROVED:

MECHANICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR [redacted] MH) PER UNIT	LABOR FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15 R VENTILATION							
250 CFM PRV 1/8" SP CENT	2	EA	8.0	16.0	985.00	1,970	JOE MAC
AL W/FIRE STAT. & LOUVER							
850 CFM PRV 1/8" SP. CENT	1	EA	10.0	10.0	1,086.15	1,086	
AL W/FIRE STAT & LOUVER							
1500 CFM PRV EXCH 1/4" SP	1	EA	8.0	8.0	1194.95	1,195	
FAN W/BIRD SCREEN FIRE							
STAT. & LOUVER							
FLASHING	75	LB	.15	11.3	1.94	146	
EXHAUST FAN 300 CFM W/MOTOR	1	EA	8.0	8.0	190.05	190	
RAINTITE LOUVER 24"X10"	1	EA	6.0	6.0	284.41	284	
W/MOTORIZE DAMPER							
CEILING GRILL 12" X 8"	1	EA	1.5	1.5	43.00	43	JOE MAC
MISCEL. HARDWARE	10	EA	1.0	10.0	1.70	17	886-8405
CRANE RENTAL 10 TON	1	EA	8.0	8.0	232.00	232	ORL
TOTAL				78.8		5,163	
LABOR HOURS x RATE	78.8	HR	21.08	1,661			
PT & I AND SALES TAX		%	25	415	5	258	
TOTAL				2,076		5,421	7,497
OVERHEAD	15	%					1,125
						SUB-TOTAL	8,622
PROFIT	10	%					862
						SUB-TOTAL	9,484
PRIME MARK UP	10	%					948
						SUB-TOTAL	10,432
BOND	1	%					104
TOTAL TO SHT. 23	4	PRV		2,634			10,536

KSC FORM 21-263 (REV 6-80)

Figure D-6. Construction Cost Estimate, Mechanical Interior Summary (Sheet 6 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 29 OF 42 SHEET E-1 OF	
PROJECT/WO TITLE: ORDNANCE BUILDING LC 39		DRAWING NO S: 79K67392	SHEET NO: E1-10
STATION SET	LOCATION: JOHN F KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J. B. SMITH INC.		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: BROWN JB SMITH INC	CHECKER: KOLE JB SMITH INC	APPROVED: J. B. SMITH PRES	

ELEMENT SUMMARY: ELECTRICAL INTERIOR

	QUANTITY		LABOR (MH)		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	☐ FIELD ☐ PAB TOTAL	PER UNIT	FROM SHEET	
16 N LOW VOLTAGE WIRING	44	FIXT.		2040		30	89,775
16 G GROUNDING SYSTEM	18	ROD		675		34	12145
	4100	SF		24.86		2	101,923

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KSC FORM 21-243 (REV 4 80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 1 of 6)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C95	DATE COMPLETED: MAY 1, 1985	SHEET 30 OF 42 SHEET E-3 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC39		DRAWING NO(S): 79K67392 — SHEET NO: E1-10
STATION SET: — LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: BROWN J.B. SMITH INC	CHECKER: KOLE J.B. SMITH INC	APPROVED: J.B SMITH PRES

ELECTRICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR [redacted] MH) PER UNIT	LABOR FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	FROM SHEET
16 N LOW VOLTAGE WIRING				183.3		4984	31
44 LIGHT FIXTURES				378.1		34,303	32
16 S SWITCH BD & PANEL BDS				238.3		3,936	33
TOTALS				799.7		43,223	
LABOR HOURS × RATE	799.7	HR	18.50	14,794			
FT & I AND SALES TAX		%	25	3699	5	2,161	
TOTALS				18,493		45,384	63,877
OVERHEAD	15	%					9,582
						SUB TOTAL	73,459
PROFIT	10	%					7,346
						SUB TOTAL	80,805
PRIME MARKUP	10	%					8,081
						SUB TOTAL	88,886
BOND	1	%					889
TOTAL TO SHT 29	44	FIXT		2040			89,775

OFFICIAL USE ONLY

KSC FORM 21-243 (REV 4/80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 2 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 31 OF 42 SHEET E-3 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NOS: 79K67392	SHEET NO: E1-E10
STATION SET / LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.		PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J B. SMITH INC	CHECKER: PURVIS J.B SMITH INC	APPROVED: J A. BROWN DD-FED	

ELECTRICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16. N-LOW VOLT WIRING & CONT DEVICE							
"J" BOX 4"x6"x6" E.P	3	EA	1.5	4.5	111.30	334	NPS
AIR TERMINAL 5/8" ϕ x 24	12	EA	.5	6.0	16.76	201	THOMPSON
AIR TERMINAL BASE & CLAMP	12	EA	1.0	12.0	10.50	126	THOMPSON
OUTLET BOX WP	14	EA	.8	11.2	8.60	120	
CONN CONTROL DEVICES	17	EA	1.0	17.0	5.00	85	
CONN ANNUNC SENSOR ELEMENT	6	EA	1.0	6.0	5.50	33	
SPEAKER OUTLET	3	EA	1.0	3.0	4.50	14	
SWITCH 1P EP	2	EA	.5	1.0	53.42	107	SQ"D"
SWITCH MO-CTC EP	2	EA	.8	1.6	125.08	250	SQ"D"
SWITCH SPST	2	EA	.35	.7	4.30	9	CES
SWITCH 3P, 100A, N/F EP	1	EA	4.0	4.0	610.00	610	SQ"D"
RECEPT 3W, 2P, 120V EP	10	EA	.8	8.0	157.09	1,571	GRAYBAR
RECEPT 3W, 2P, 120V	3	EA	.35	1.1	4.35	13	CES
LIMIT SW SP, EP	3	EA	.8	2.4	108.12	324	SQ"D"
SWITCH 30A, 2P, N/F WP	3	EA	2.5	7.5	109.00	327	SQ"D"
THERMOSTAT WP	2	EA	.5	1.0	80.00	160	
THERMOSTAT	1	EA	.35	.4	26.00	26	NPS
CONDUIT FITTINGS GAL 1½"	6	EA	.8	4.8	14.29	86	CES
1"	4	EA	.5	2.0	5.56	22	
¾"	35	EA	.4	14.0	3.90	137	
½"	30	EA	.4	12.0	3.10	93	CES
SEALING FITTINGS GAL 2"	6	EA	3.0	18.0	18.63	112	HUGHES
1½"	4	EA	2.4	9.6	14.34	57	
1"	7	EA	2.5	5.0	7.83	16	
¾"	10	EA	1.25	12.5	6.06	61	
½"	14	EA	1.0	14.0	5.17	72	
SQUEEZE CONN ½"	10	EA	.4	4.0	1.20	12	HUGHES
SUBTOTAL TO SHT 30				183.3		4,978	

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 3 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 32 OF 42 SHEET E-4 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: E 2-E 4
STATION SET / LOCATION: JOHN F KENNEDY SPACE CENTER, FLA		PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B SMITH INC	CHECKER: PURVIS J.B SMITH INC	APPROVED: J.A. BROWN DD-FED	

ELECTRICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR MH) PER UNIT	LABOR MH) FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16 N #2 AWG 1/c WIRE	700	LF	.02	14.0	.50	350	GEN CABLE
#6 AWG 1/c WIRE	200	LF	.01	2.0	.17	34	
#10 AWG 1/c WIRE	210	LF	.007	1.5	.08	17	
#12 AWG 1/c WIRE	8980	LF	.006	53.9	.06	539	
#14 AWG 1/c WIRE	550	LF	.006	3.3	.03	17	
#2/0 BSD WIRE	1000	LF	.03	30.0	.716	716	
#2 BSD WIRE	250	LF	.02	5.0	.359	90	GEN CABLE
#12 GALV 500' WIRE	1	C/LB	.1	22.0	4960	50	TRAVIS
#12 AWG 3/c SO CORD	30	LF	.02	.6	.99	30	NPS
CABLE CLAMP #2/0 WIRE	45	EA	.20	9.0	6.69	301	NPS
BALLAST WIREWAY 6"X6"	1	EA	14	1.4	2968	30	CN
200W FIXT. TYPE V6-A VAPOR	6	EA	.6	3.6	3528	212	NPS
100W FIXT TYPE 1-3	8	EA	.5	4.0	27.10	217	
100W FIXT. TYPE MV	18	EA	2.0	36.0	5038	907	
100W FIXT. TYPE 1-HB	6	EA	1.6	9.6	4368	262	
2X4 4LP FIXT. TYPE FLUOR	5	EA	4.0	20.0	12320	616	
200W FIXT. TYPE RB ROTATING BEACON	1	EA	1.8	1.8	10241	102	
LAMP INCAND 150W	6	EA	.02	.1	2.09	13	
200W	8	EA	.02	.2	2.89	23	
1000W	6	EA	.05	.3	1562	94	
FLOODLIGHT MTG POLE	5	EA	5.0	25.0	88.40	442	
LAMPS MV 400 W	23	EA	.05	1.2	24.96	563	
BALLAST 400W MERC V	18	EA	2.0	36.0	81.54	1468	NPS
UNISTRUT FIXT. SUPPORT	850	EA	.06	15.0	1.56	390	UNISTRUT
EMERGENCY LIGHT	1	EA	1.5	1.5	16464	165	GRAYBAR
EMERGENCY BATTERY & SUPPORT	1	EA	4.5	4.5	9400	94	
PHOTO CELL	1	EA	2.2	2.2	5152	52	
MCC "AP"	1	EA	740	740	26509	26509	GX QUOTE
SUB TOTALS TO SHT 30				378.1		34,503	

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 4 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 33 OF 42; SHEET E-5 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392 SHEET NO: E5-E8
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.		PCN: 79406 PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: KOLB J.B. SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J A BROWN DD-FED

ELECTRICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR MH) PER UNIT	LABOR MH) ☐ FIELD ☐ PAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16 ELECTRICAL INTERIOR							
G SWITCH BOARD-PANEL BOARD							
PANEL AC-1 BKRS	1	EA	20.5	20.5	408.80	409	NPS
PANEL TTC 30X24X6 5/8	1	EA	4.5	4.5	190.40	190	HOFFMAN
PANEL PC 16X12X6 5/8	1	EA	1.8	1.8	67.20	67	
PANEL FA 24X24X6 5/8	1	EA	1.0	1.0	146.36	146	
2DR PANEL FLP 72X48X18	1	EA	4.0	4.0	676.40	676	
CABINET DOOR OPR.	3	EA	2.5	7.5	51.52	155	
PUSH BUTTON & SUPP	3	EA	2.0	6.0	4.91	15	HOFFMAN
PRESSURE GAGE	3	EA	1.0	3.0	18.20	55	JOHNSON
CRANK	3	EA	.02	.1	1.12	3	JOHNSON
L LOW VOLTAGE BUSWAYS							
CONDUIT 3½" GALV. RIGID	20	LF	.35	7.0	4.80	96	YOUNGSTOWN
CONDUIT 3" GALV. RIGID	20	LF	.23	4.6	3.825	77	STEEL & TUBE
CONDUIT 2" GALV. RIGID	125	LF	.14	17.5	1.81	226	
CONDUIT 1½" GALV. RIGID	220	LF	.11	24.2	1.33	293	
CONDUIT 1¼" GALV. RIGID	20	LF	.09	1.8	1.15	23	
CONDUIT 1" GALV. RIGID	170	LF	.07	11.9	.86	146	
CONDUIT ¾" GALV. RIGID	870	LF	.05	43.5	.60	557	
CONDUIT ½" GALV. RIGID	1,230	LF	.04	49.2	.53	652	
CONDUIT ELLS 3½"	2	EA	4.5	9.0	32.35	65	
CONDUIT ELLS 3"	2	EA	3.7	7.4	18.67	37	
CONDUIT ELLS 2"	4	EA	1.6	6.4	6.29	25	
CONDUIT ELLS 1½"	3	EA	1.8	5.4	4.10	12	
CONDUIT ELLS 1¼"	2	EA	1.0	2.0	3.29	7	STEEL & TUBE
TOTALS TO SHT. 30				238.5		3936	

KSC FORM 21-243 (REV 6/80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 5 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE	DATE COMPLETED	SHEET / OF
C 95	MAY 1, 1985	SHEET 34 OF 42 SHEET E-6 OF

PROJECT/B O TITLE	DRAWING NO'S	SHEET NO
ORDNANCE BUILDING LC 39	79K67392	E9 - E10

STATION SET	LOCATION	PCN	PD/CCBD
	JOHN F. KENNEDY SPACE CENTER, FLA	77406	

ARCHITECT OR ENGINEER	WORK ORDER OR CONTRACT NO
J.B. SMITH INC. **OFFICIAL USE ONLY**	6005

ESTIMATOR	CHECKER	APPROVED
KOLB J.B. SMITH INC	PURVIS J.B SMITH INC	J.A. BROWN DD-FED

ELECTRICAL INTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16 GROUNDING SYSTEM							
GROUNDING RECEPTACLE	8	EA	1.0	8.0	25.09	201	NPS
GROUND ROD STE	18	EA	2.0	36.0	49.27	887	NPS
MISC. GROUND CONN. WIRE		A/R	200.0	200.0	896.00	896	
CONN. SMALL MOTOR 1/3 HP	3	EA	2.5	7.5	7.62	23	
CONN MED MOTOR 1/2 HP	2	EA	3.0	6.0	10.08	20	
CONN. MED. LG. MOTOR 1 HP	1	EA	4.0	4.0	12.21	12	
CONN. LARGE MOTOR 15 HP	1	EA	6.0	6.0	35.84	36	
CONN. DUCT HEATERS	1	EA	2.0	2.0	7.28	7	
CONN. HUMIDIFIER	1	EA	2.0	2.0	7.28	7	
FLA STA. MAIN WP	1	EA	1.0	1.0	12.54	13	
6" FA BELL W/WP HOUSING	1	EA	.8	.8	37.63	38	SYS SER
TEL OUTLET E&P	2	EA	.8	1.6	9.80	20	COOK
TEL OUTLET	1	EA	.6	.6	4.79	5	COOK
SUBTOTAL				275.5		2165	
LABOR HOURS × RATE	275.5	HR	18.50	5,097			
PT&I AND STALEY TAX		%	25	1,274	5	.108	
				6,371		2273	8644
OVERHEAD	15	%					1,297
						SUBTOTAL	9941
PROFIT	10	%					994
						SUBTOTAL	10,935
PRIME MARK-UP	10	%					1,093
						SUBTOTAL	12,028
BOND	1	%					120
TOTAL TO SHT. 29	18	ROD		675.00			12,148

RSC FORM 21-243 (REV 4/80)

Figure D-7. Construction Cost Estimate, Electrical Interior Summary (Sheet 6 of 6)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 35 OF 42; SHEET EM-1 OF
PROJECT/B O TITLE: ORDNANCE BUILDING LC39		DRAWING NO(S): 79K67392 — SHEET NO: M-28-29-30
STATION SET: — LOCATION: JOHN F KENNEDY SPACE CENTER, FLA		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J B SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: KOLB J.B SMITH INC	CHECKER: PURVIS J B SMITH INC	APPROVED: J.A. BROWN DD. FED

EXTERIOR UTILITIES MECHANICAL ELEMENT SUMMARY

	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL FROM SHEET	TOTAL COST
15 F HTHW DISTRIBUTION	1,000	LF	34.72			36	34,715
G SANITARY SEWERS	160	LF	36.54			37	5,846
Y WATER SUPPLY LINES	1014	LF	37.309			38	37 83
TOTAL EXTERIOR UTILITIES	2,174	LF	36.059	TO	G+T ?		78,392

OFFICIAL USE ONLY

KSC FORM 21-243 (REV 4/80)

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 1 of 4)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 36 OF 42 SHEET EM-2 OF	
PROJECT/B O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: M 28
STATION SET:	LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.	PCN: 77406	PO/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B. SMITH INC.	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J.A. BROWN DD-FED	

EXTERIOR UTILITIES MECHANICAL SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15 F HTHW DISTRIBUTION							
1½" PIPE BLK SEAMLESS SCH 40	400	LF	.16	640	2.09	836	MCJUNKIN
2" TH FOAMGLASS - FOR 1½" PIPE	400	LF	25	1000	2.64	1,056	NORTH BROS
12" PIPE-CASING SCH 40	200	LF	.92	1840	28.60	5720	MCJUNKIN
1½ STR ELLS IN 12" CASING	8	EA	1.5	12.0	187.00	1,496	HUGHES
FOR EXPANSION LOOP							
ANCHOR	5	EA	10	50	21.56	108	
DEWATERING	200	LF	235	470	11.55	2310	M & W PUMP
SEAL PLATE	25	EA	.20	5.0	5.50	138	
EXCAVATION & BACKFILL	37	CY	.30	11.1	6.60	244	
CRANE RENTAL	1	EA	16.0	16.0	470.00	470	
				444.1		12,378	
LABOR HOURS × RATE	444.1	HR	21.08	9362			
PT&I AND SALES		%	25	2341	5	619	
				11,703		12,997	24,700
OVERHEAD	15	%					3,705
						SUBTOTAL	28,405
PROFIT	10	%					2841
						SUBTOTAL	31,246
PRIME MARK UP	10	%					3,125
						SUBTOTAL	34,371
BOND	1	%					344
TOTAL TO SHT 35	1,000	LF		34.72			34,715
MCJUNKIN 813-665-6331 LAKELAND							
NORTH BROS 293-9221 ORL							
HUGHES 843-9100 ORL							
M & W PUMP 723-0897 GRANT							

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 2 of 4)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 37 OF 42 SHEET EM-3 OF	
PROJECT/B.O. TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: M 29
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J B SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B. SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J. A. BROWN DD-FED	

EXTERIOR UTILITIES MECHANICAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
15 G SANITARY SEWERS							
6" SOIL PIPE	100	LF	.40	400	5.63	563	HUGHES
6" COMBINATION "Y"	1	EA	2.0	20	35.38	35	
6" 1/4" BEND	1	EA	2.0	20	27.54	28	
6" 1/8" BEND	2	EA	2.0	40	18.46	37	
3" "P" TRAP	2	EA	3.0	6.0	40.04	80	
3" FLOOR DRAIN	2	EA	4.0	8.0	71.73	143	
CAULKING	40	LB	—	—	1.41	56	
OKUM	4	LB	—	—	8.58	34	
LPGAS	4	LB	—	—	6.50	26	
3" CHAULKING JOINTS	14	EA	.50	7.0	—	—	HUGHES
CONC. PIPE	1	EA	—	—	104.50	105	
DRY WELL 24" x 5'	1	EA	8.0	8.0	286.00	286	
4" ACID WASTE PIPE - PVC	60	LF	.30	18.0	3.07	184	HUGHES
				95.0		1,577	
LABOR HOURS x RATE	95.0	HR	21.08	2,003			
P&I AND SALES TAX		%	25	501	5	79	
				2,504		1656	4,160
OVERHEAD	15	%					624
							4,784
PROFIT	10	%					478
							5,262
PRIME MARK-UP	10	%					526
							5788
BOND	1	%					58
TOTAL SANITARY SEWERS TO SHT 35	160	LF		3654			5846

KSC FORM 21-243 (REV 6/80)

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 3 of 4)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 38 OF 42 SHEET GM-4 OF	
PROJECT/R O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67897	SHEET NO: M-30
STATION SET / LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.		PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC. **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B. SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J A. BROWN DD-FED	

EXTERIOR UTILITIES MECHANICAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST	
15 Y WATER LINES-SUPPLY LINES								
10" TAPPING VALVE	1	EA	20.0	20.0	803.88	803		HUGHES
10" TAPPING SLEEVE	1	EA	20.0	20.0	738.00	738		
2" GATE VALVE W/BOX	1	EA	.7	.7	171.91	172		
FIRE HYDRANT & EXT.	3	EA	12.0	36.0	924.53	2773		
10" C I PIPE	475	LF	.28	133.0	13.75	6531		
6" C I PIPE	336	LF	.17	57.1	9.37	3148		
2" GALV STEEL PIPE	203	LF	.22	44.7	2.92	593		
10" C.I TEE	2	EA	9.0	18.0	497.39	995		
6 C I TEE	2	EA	5.3	10.6	163.74	327		
2" GALV. TEE	4	EA	1.2	4.8	32.33	129		
10"X6" C.I REDUCER	1	EA	3.0	3.0	423.40	423		
10" PLUG	1	EA	2.5	2.5	18.38	18		
6" 1/4 BEND	1	EA	2.85	2.9	27.54	28		
6" 1/8 BEND	1	EA	2.85	2.9	18.46	18		HUGHES
				356.2		16,696		
LABOR HOURS X RATE	356.2	HR	21.08	7,509				
PT&I AND SALES TAX		%	25	1877	5	835		
				9,386		17,531	26,917	
OVERHEAD	15	%					4,038	
							30,955	
PROFIT	10	%					3,096	
							34,051	
PRIME MARK-UP	10	%					3,405	
							37,456	
BOND	1	%					375	
WATER SUPPLY LINE TOTAL TO SHT. 35				1014	LF	37.309	37,831	

KSC FORM 21-243 (REV 6-80)

Figure D-8. Construction Cost Estimate, Exterior Utilities - Mechanical Summary (Sheet 4 of 4)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 39 OF 42 SHEET EE-1 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67892 SHEET NO: E 15
STATION SET:	LOCATION: JOHN F KENNEDY SPACE CENTER, FLA	PCN: 77406 PD/CCBD:
ARCHITECT OR ENGINEER: J B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: KOLB J B SMITH INC	CHECKER: KURVIS J B. SMITH INC	APPROVED: J.A. BROWN DD-FED

ELECTRICAL EXTERIOR SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS	LABOR [redacted] MH) PER UNIT	LABOR FIELD TOTAL FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16 A SITE WORK FROM SHT.	40			2651.6		27,953	
16 B MED & HI-VOLT POWER LINES FROM SHT	41			837.3		186,306	
				3488 9		214,259	
LABOR HOURS × RATE	3488.9	HR	18.50	64,545			
PT & I AND SALES TAX		%	25	16,136	5	10,713	
				80,681		224,972	305,653
OVERHEAD	15	%					45,848
							351,501
PROFIT	10	%					35,150
							386,651
PRIME MARK-UP	10	%					38,665
							425,316
BOND	1	%					4,253
TOTAL TO SHT 2 ELEC. EXT	2000	KVA		21252			420,560

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KSC FORM 21-243 (REV 6/80)

Figure D-9. Construction Cost Estimate, Electrical Exterior Summary (Sheet 1 of 3)

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 40 OF 47 SHEET EE-2 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67392	SHEET NO: E11-E13
STATION SET / LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA		PCN: 77406	PD/CCBD:
ARCHITECT OR ENGINEER: J.B SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B. SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J.A. BROWN DD-FED	

ELECTRICAL SITE WORK SUMMARY	QUANTITY NO UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16. A MANHOLE TYPE "C" POWER							
DEWATER HEADER	200	LF	3.77	754.0	22.17	4,434	
EXCAVATION	767	CY	.06	46.02	.83	637	BREVARD REN
CONCRETE 3,000 PSI	56	CY	.25	14.0	45.00	2,520	RINKER
FORMWORK	2151	SFCA	.14	301.1	.83	1785	
REBAR	6,255	LB	.01	62.6	32	2002	
FRAME & COVER TRAFFIC	1	EA	12.2	12.2	350 00	350	BROOKS PROD
PULLING-IRONS-STAIRS ETC	95	LB	.1	9.5	.65	62	
BACK FILL & COMPACTION	607	CY	.2	121.4	.70	425	
INTERIOR RACKS W/6 HOOKS	8	EA	1.25	10.0	31 00	248	HUGHES
INSULATORS	48	EA	.30	14 0	140	67	HUGHES
MANHOLE TYPE "D" COMM							
DEWATER	150	LF	4.03	604.5	22.17	3,326	
EXCAVATION	194	CY	.101	19.5	1.22	237	
CONCRETE 3000 PSI	20	CY	.25	5.0	45.00	900	RINKER
FORMWORK	806	SFCA	.15	120.9	.83	669	
REBAR	2,234	LB	.015	33.5	.32	715	
FRAME & COVER-TRAFFIC	1	EA	12.2	12.2	350 00	350	BROOKS PROD
PULLING-IRONS-STAIRS	60	LB	.1	6.0	.65	39	
BACK FILL & COMPACTION	166	CY.	.2	33.2	.70	116	
INTERIOR RACKS	6	EA	.75	4.5	31 00	186	HUGHES
INSULATORS	18	EA	.08	1.4	1.40	25	HUGHES
FORMER PAD 10x20x1	8	CY	8.6	68.6	4500	360	RINKER
GRAVEL LOADED & COMPACTED	10	CY	.84	8.4	12.00	120	
GUARD CHAIN & HDW	1	EA	7.0	7.0	50.00	50	
4W4 DUCT & CONCENCASED	500	LF	.6	300.0	13.50	6750	
2W4-2W3 DUCT CONC. "	100	LF	.5	50.0	9.00	900	
2W3- " " "	80	LF	.4	32.0	8.50	680	
SITE WORK SUB TOTAL TO SHT 39				2451.6		27,953	

Figure D-9. Construction Cost Estimate, Electrical Exterior Summary (Sheet 2 of 3)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C 95	DATE COMPLETED: MAY 1, 1985	SHEET 41 OF 42; SHEET EE-3 OF
PROJECT/W O TITLE: ORDNANCE BUILDING LC39		DRAWING NOS.: 79K67392 — SHEET NO: E 14-E 15
STATION SET: — LOCATION: JOHN F KENNEDY SPACE CENTER, FLA.		PCN: 77406 — PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC. **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005
ESTIMATOR: KOLB J.B SMITH INC	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J A BROWN DD FED

ELECTRICAL EXTERIOR SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) FIELD TOTAL / FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
16 B MED & HI-VOLT POWER LINES							
CONDUIT RIGID ST 3½	140	LF	.35	49 0	4.55	637	CES
CONDUIT RIGID ST. ¾"	70	LF	06	4.2	.62	43	
4" CONDUIT FLEX & END BUSH 4"	2	EA	5.8	11.6	90	180	
4" CONDUIT FLEX & END BUSH 3½	2	EA	45	9.0	82 00	164	
ADAPTORS RIGID DUCT 4"	2	EA	1.3	2 6	4 50	9	
ADAPTORS RIGID DUCT 3"	2	EA	1.0	2.0	380	8	CES
½-4/C FILE NJ-15KV CABLE	950	LF	12	114.0	8.55	8,123	ANIXTER
15 KV FILE SLICE	2	EA	240	48.0	75.00	150	HUGHES
15KV FILE END TERM	2	EA	24 0	48.0	250 00	500	HUGHES
THHN 350 MCM-½-600V-CU	650	LF	.11	71 5	1 78	1,157	CES
THHN #10 AWG-½-600V-CU	250	LF	.02	5.0	.07	18	CES
¾ ϕ x 30' CU-CLAD GRD ROD	6	EA	2 0	12.0	57 50	345	CES
#2/0 BSD WIRE GRD	80	LF	.03	2 4	.648	52	HUGHES
GROUND CONN	1	EA	8 0	8.0	20 00	20	
2000KVA DOUBLE END SUBSTA							
2000KVA TRANSFORMER TRANOL	2	EA	50.0	100.0	25,000	50,000	MARK
138KV LB SWITCH W/FUSES	2	EA	12 0	24.0	11,000	22,000	HATFIELD
3000A SECONDARY MAINS	2	EA	15.0	30 0	13,600	27,200	WEST
3000A TIE BREAKER	1	EA	16.0	16.0	13,600	13,600	
800A FEEDER BREAKER	3	EA	8.0	24.0	3825	11,475	
600A FEEDER BREAKER	8	EA	8.0	64.0	3825	30,600	
TRANSITION SECTION	2	EA	8.0	16.0	3800	7,600	
CURRENT TRANSFORMER	8	EA	5.0	40.0	425.	3,400	
POWER TRANSFORMER	4	EA	5.0	20.0	595	2380	
AMMETER-VOLTMETER	4	EA	2.0	8.0	850.	3,400	
AMMETER-VOLTMETER SWITCH	4	EA	2.0	8.0	450.	1800	
WEATHER PROOFING	1	EA	100.0	100.0	1445.	1445	
SUB TOTAL TO SHT 39				837.3		186,306	

Figure D-9. Construction Cost Estimate, Electrical Exterior Summary (Sheet 3 of 3)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C95	DATE COMPLETED: MAY 1, 1985	SHEET 42 OF 42 SHEET EE4 OF	
PROJECT/W O TITLE: ORDNANCE BUILDING LC 39		DRAWING NO(S): 79K67892	SHEET NO: M-31 M32
STATION SET	LOCATION: JOHN F. KENNEDY SPACE CENTER, FLA.	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B SMITH INC **OFFICIAL USE ONLY**		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: KOLB J.B. SMITH INC.	CHECKER: PURVIS J.B. SMITH INC	APPROVED: J.A. BROWN DD-FED	

SPECIAL CONSTRUCTION SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD TOTAL ☐ FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
13 F GASEOUS NITROGEN GN2		.					
½" SOLENOID VALVE W/M	1	EA	1.28	1.3	417.07	417	CIRCLE SEAL
½" GLOBE VALVE W/M	2	EA	1.28	2.6	154.29	309	CIRCLE SEAL
½" PRESS GAGE W/M	2	EA	1.28	2.6	60.96	122	
½" FILTER 10-MICRON	1	EA	1.28	1.3	25.45	25	GULF CONTROLS
½" PRESS REGULATOR	1	EA	1.28	1.3	266.00	266	GROVE VALVE
½" TUBING .072 WALL 304 S/S	50	LF	1.80	90.0	4.18	209	WALL TUBE
KC103 SEAL RING	20	EA	.10	2.0	.40	8	NIABCO
KC107C8 TEE	4	EA	.48	1.9	26.38	106	
KC112C8 ADAPTER	6	EA	.32	1.9	5.85	35	
KC126C8 UNION	4	EA	.32	1.3	7.41	30	
KC142C8 NUT	20	EA	.16	3.2	1.51	30	
KC143C8 SLEEVE	20	EA	.16	3.2	1.54	31	
75M04185-2-8 BAND MARKER	10	EA	.10	1.0	.41	4	
CLEANING COMPONENTS	8	EA	3.0	24.0	3.85	31	SEE SHT 6
CLEAN TUBE ASSYS	10	EA	1.0	10.0	3.85	39	FOR DETAIL
GFE GN2 10,000 PSIG PANEL	4	EA	2.5	10.0	82.50	330	GFE VALUE
TEST & CHECK OUT	4	EA	7.5	30.0	-	-	$150,000
LABOR HOURS x RATE	187.6	HR	21.08	3,955		1,992	
PT&I AND SALES TAX		%	25	989	5	100	
SUBTOTAL				4944		2092	7,036
OVERHEAD	15	%					1,055
SUBTOTAL							8,091
PROFIT	10	%					809
SUBTOTAL							8,900
PRIME MARK UP & BOND	10	%	+ 1%				988
TOTAL GN2 TO SHT 2	50	LF	197.76				9,888

KSC FORM 21-243 (REV 6/80)

Figure D-10. Construction Cost Estimate, Special Construction Summary

APPENDIX E

BID COST ESTIMATE
(CODE C-100)

COST ESTIMATE COVER SHEET

**GOVERNMENT ESTIMATES ARE ADMINISTRATIVELY CONFIDENTIAL
ACCESSIBLE TO AUTHORIZED NASA/KSC PERSONNEL OR REPRESENTATIVES ONLY**

PROJECT ORDNANCE BUILDING 4100 SF

LOCATION KSC-LC 39-VAB AREA

IFB NO MADE UP 10-00-123-5

BID DATE AUG 15, 1985

AMENDMENT AMEND* 1 DATED 6-8-85 AMEND*2 DATED 6-10-85

ESTIMATE CODE C100

PCN 77406

CONTRACT W.O. 6005

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DRAWING NO 79K67302 SHT 80

MODEL NO N/A

LEAD DESIGNER NASA DO-ED03 ALICE JONES J.B. SMITH A&E

KSC COST ENGINEER JOE A BROWN NASA

PROJECT ENGINEER D. RAINWOOD J.B. SMITH A&E

PREPARED BY J.B. SMITH A&E FRC KSC

FIRM/ADDRESS 1400 APOLLO BLVD ROCKET CITY,

LOCATION UTAH 42134

SUBMITTAL DATE JULY 22, 1985.

ESTIMATED BY VARNDELL FRC 2421

PHONE NO. 867-2725

REVIEWED BY I. SEYMORE

APPROVED BY R.V. SURE

PHONE NO. 867-3994

Cost Estimating for procurement requires special handling in accordance with DE ID-1142.23, KSC SPEC-G-0002 and KSC SPEC-G-0003 for GSE.

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KSC FORM 21-868 (3/83)

Figure E-1. Cost Estimate Cover Sheet

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SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	2. SOLICITATION NO	3. TYPE OF SOLICITATION	4. DATE ISSUED	PAGE OF PAGES
	10-00-123-5	☐ SEALED BID (IFB) ☐ NEGOTIATED (RFP)	7-15-85	

IMPORTANT – The "offer" section on the reverse must be fully completed by offeror

5. CONTRACT NO	6. REQUISITION/PURCHASE REQUEST NO	6. PROJECT NO
	10-00-123-5	77406

7. ISSUED BY CODE	8. ADDRESS OFFER TO
JOHN F. KENNEDY SPACE CENTER, NASA PROCUREMENT OFFICE KENNEDY SPACE CENTER, FLORIDA 32899 SI-PRO-31	JOHN F. KENNEDY SPACE CENTER, NASA PROCUREMENT OFFICE, CODE SI-PRO-A HEADQUARTERS BLDG., ROOM 2414 KENNEDY SPACE CENTER, FLORIDA 32899

9. FOR INFORMATION CALL:	(A) NAME	(B) TELEPHONE NO (Include area code) (NO COLLECT CALLS)
	COPIES: ATS/PRO Questions: G. D. Fain	Copies. 305/867-2851Quest: 305/867-7230

SOLICITATION

NOTE In sealed bid solicitations offer and offeror mean bid and bidder

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date)

ORDNANCE BUILDING KSC, FLA.

TASK I SITE WORK OUTSIDE 5' LINE

TASK II BUILDING STRUCTURE TO 5' LINE, INCLUDING STRUCTURAL - MECHANICAL - ELECTRICAL

TASK III UTILITIES OUTSIDE 5' LINE

TASK IV (OPTION) SPECIALIZED CONSTRUCTION GN_2 LINE

MAGNITUDE 1,000,000 TO 5,000,000

PRIORITY RATING (DMS REG #1)

OFFICIAL USE ONLY

11. The Contractor shall begin performance within 5 calendar days and complete it within 210 calendar days after receiving ☐ award ☒ notice to proceed. This performance period is ☒ mandatory ☐ negotiable (See _____)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If YES, indicate within how many calendar days after award in Item 12B.)	12B. CALENDAR DAYS
☒ YES ☐ NO	Within 5 days after request

13. ADDITIONAL SOLICITATION REQUIREMENTS

A. Sealed offers in original and 2 copies to perform the work required are due at the place specified in Item 8 by 3:00 pm (hour) local time Bid 8-15-85 (date). If this is a sealed bid solicitation offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

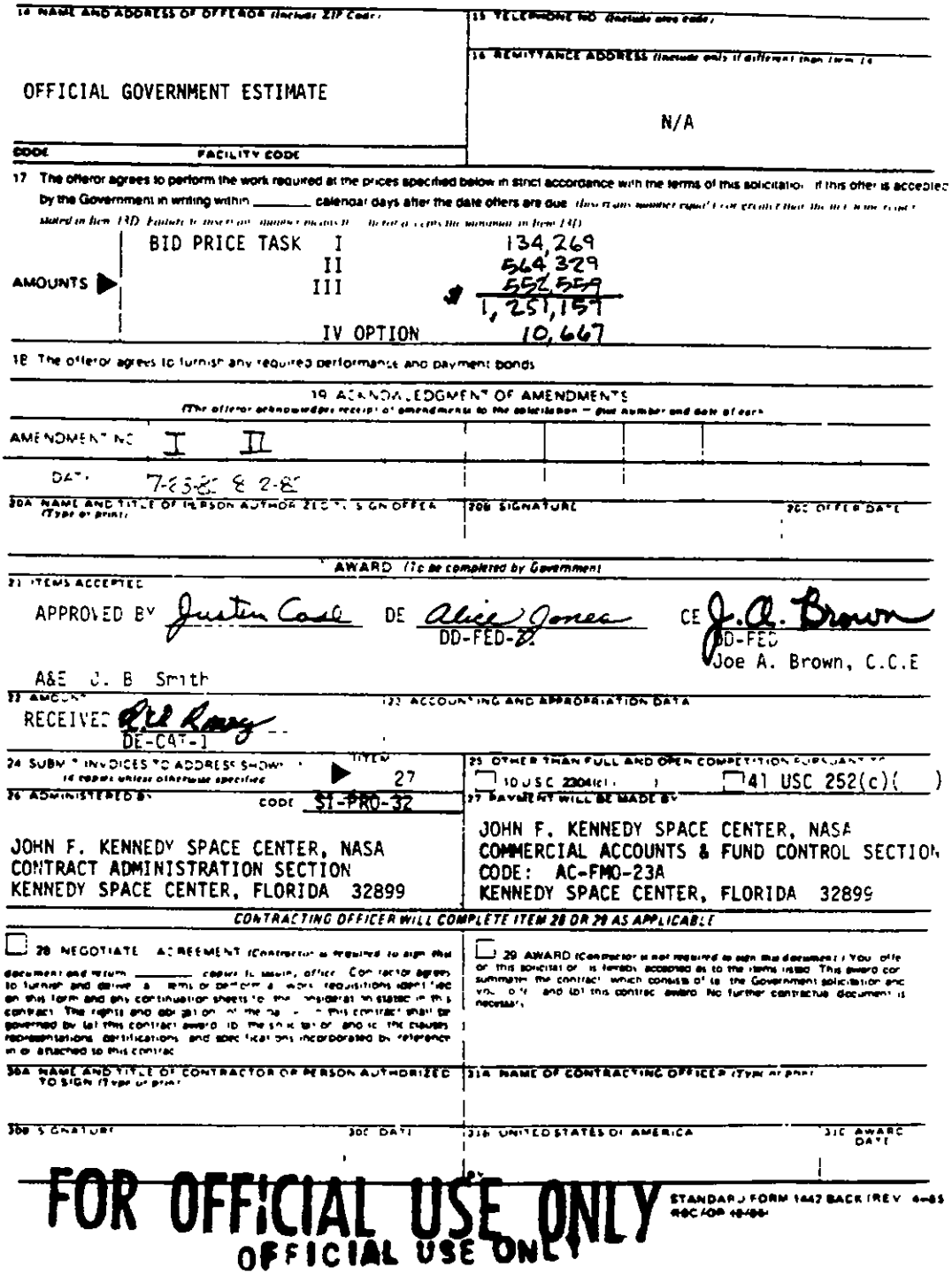
B. An offer guarantee ☒ is ☐ is not required

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference

D. Offers providing less than 60 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected

NSN 7540-01-155-32 2 — 1442 101 — STANDARD FORM 1442 (REV. 4-85) Prescribed by GSA KSC OP 12 96 FAR (48 CFR) 53.236-1(a)

Figure E-2. Bid Form, Construction Contract (Sheet 1 of 2)



16 NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

OFFICIAL GOVERNMENT ESTIMATE

CODE FACILITY CODE

15 TELEPHONE NO (Include area code)

16 REMITTANCE ADDRESS (Include only if different than Item 14)

N/A

17 The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation. If this offer is accepted by the Government in writing within _____ calendar days after the date offers are due (Insert any number equal to or greater than the minimum requirement stated in Item 10). Failure to insert any number means the offeror accepts the minimum in Item 10.

AMOUNTS

BID PRICE TASK	I	134,269
	II	564,329
	III	552,559
		1,251,157
	IV OPTION	10,667

18 The offeror agrees to furnish any required performance and payment bonds

19 ACKNOWLEDGMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation — give number and date of each)

AMENDMENT NO I II

DATE 7-23-85 & 7-8-85

20A NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)

20B SIGNATURE

20C OFFER DATE

AWARD (To be completed by Government)

21 ITEMS ACCEPTED

APPROVED BY Justin Case DE Alice Jones DD-FED-82 CE J.A. Brown DD-FED Joe A. Brown, C.C.E

A&E J. B Smith

22 AMOUNT

RECEIVED Ed Roney DE-C4T-1

23 ACCOUNTING AND APPROPRIATION DATA

24 SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified) ITEM 27

25 OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO 10 USC 2304(c)( ) 41 USC 252(c)( )

26 ADMINISTERED BY CODE 51-PRO-32

JOHN F. KENNEDY SPACE CENTER, NASA
CONTRACT ADMINISTRATION SECTION
KENNEDY SPACE CENTER, FLORIDA 32899

27 PAYMENT WILL BE MADE BY

JOHN F. KENNEDY SPACE CENTER, NASA
COMMERCIAL ACCOUNTS & FUND CONTROL SECTION
CODE: AC-FMO-23A
KENNEDY SPACE CENTER, FLORIDA 32899

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28 NEGOTIATE AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office. Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29 AWARD (Contractor is not required to sign this document.) Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)

30B SIGNATURE

30C DATE

31A NAME OF CONTRACTING OFFICER (Type or print)

31B UNITED STATES OF AMERICA

31C AWARD DATE

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STANDARD FORM 1442 BACK (REV. 4-85)
PRESCRIBED BY GSA FAR 53.236-1(b)

Figure E-2. Bid Form, Construction Contract (Sheet 2 of 2)

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C100	DATE COMPLETED: JULY 22, 1985	SHEET 4 OF 6; SHEET 4 OF 48
PROJECT/W O TITLE: ORDNANCE BUILDING		DRAWING NO(S): 79K67392; SHEET NO: 1-86
STATION SET:	LOCATION: KSC LC39	PCN: 39143; PD/CCBD:
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 0576
ESTIMATOR: MIKE L BROWN JBS	CHECKER: JOHN KOLE	APPROVED: J.B. SMITH PRES

BID FORM SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
TASK							
I SITE WORK FROM SHT 2						124,462	
PRORATA SPEC CONDITIONS				.0788%		9,807	
AMENDMENT #1 & #3						0,000	
TOTAL SITE WORK TASK I	4,100	SF	32.7485				134,269
II BUILDING-STRUCT TO 5' LINE						512,652	
PRO-RATA SPEC CONDITIONS				.0788%		40,397	
AMENDMENT #1						11,280	
TOTAL BLDG TASK II	4,100	SF	137.6412				564,329
III UTILITIES OUTSIDE 5' LINE						507,981	
PRO-RATA SPEC CONDITIONS				.0788%		40,028	
AMENDMENT #2						4,550	
TOTAL UTILITIES III	4,100	SF	134.7705				552,559
TOTAL TASKS I-II-III	4,100	SF	305.1602			-	1,251,157
IV SPECIALIZED CONSTRUCTION							
GN_2 S/S PIPELINE	50	LF	197.76			9,888	
PRO-RATA SPEC. CONDITIONS				.0788%		779	
AMENDMENT #1						0,000	
OPTION TASK IV	50	LF	213.34			10,667	10,667
GFE VALUE $150,000 NIC							
TO BID FORM E-6			OFFICIAL USE ONLY				

KSC FORM 21-243 (REV 4/80)

Figure E-3. Bid Form Summary

☐ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☒ CONSTRUCTION

CODE: C-100	DATE COMPLETED: JULY 22, 1985	SHEET 3 OF 48 SHEET 2 OF 42	
PROJECT/S O TITLE: ORDNANCE BUILDING LC 39		DRAWING NOS: 79K67392	SHEET NO: C-1 THRU C-9
STATION SET	LOCATION: JOHN F KENNEDY SPACE CENTER, FLA	PCN: 77406	PD/CCBD
ARCHITECT OR ENGINEER: J.B. SMITH INC		WORK ORDER OR CONTRACT NO: 6005	
ESTIMATOR: VARNDELL PRC2501	CHECKER: WRIGHT PRC 2421	APPROVED	

PROJECT SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) ☐ FIELD ☐ FAB TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL FROM	TOTAL COST
I SITE WORK						SHT	
2A DEMOLITION PAVING	610	SY	@	3.08		4	1,880
2E EARTH WORK	6500	CY	@	7.73		4	50,273
2P BIT PAVING	3,100	SY	@	15,31		4	47,469
2T GRASSING	5,600	SY	@	1.96		4	10,984
2V STORM DRAINAGE	132	LF	@	104.97		4	13,856
SUBTOTAL							124,462
II BUILDING STRUCT - TO 5'-0" LINE							
2-14 ARCH.-STRUCT	4,100	SF	@	74.34		15	304,780
15 MECHANICAL (INT.)	4,100	SF	@	25.84		23	105,949
16 ELECTRICAL (INT)	4,100	SF	@	24.86		29	101,923
SUBTOTAL							512,652
III UTILITIES - OUTSIDE 5'-0" LINE							
15F STEAM DISTRIBUTION	1,000	LF	@	34.72		35	34,715
15G SANITARY SEWERS	160	LF	@	36.54		35	5,846
15Y WATER SUPPLY	1,014	LF	@	37.31		35	37,831
16A EXTERIOR ELEC	2,000	KVA		214.78		39	429,569
SUBTOTAL							507,961
IV SPECIALIZED CONSTRUCTION							
13F SPECIALIZED SYS. GEN	SEE OPTION I			SHT. 42			
GFE VALUE 3-PANEL @ 50,000	$150,100					49	=
EST. CONST. BID COST	41,000	SF		28170			1,145 075
SPECIAL CONDITIONS (NO D.T ESCAL)							91,031
AMEND I FROM SHT 4						4	11,280
AMEND II FROM SHT 4						4	4,550
OPTION I SHT 42	50	LF	@	197.76		42	9,888
							=
BID COST ESTIMATE	4100	SF	@	307.76			1,261,824

KSC FORM 21-345 (REV 4/80)

OFFICIAL USE ONLY

Figure E-4. Project Summary

☐ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE C100%	DATE COMPLETED July 8, 1985	SHEET 6 OF 6 SHEET ___ OF ___	
PROJECT/W O TITLE Ordnance Building		DRAWING NO:S 79K67392	SHEET NO
STATION SET	LOCATION John F. Kennedy Space Center, KSC, FL	PCN 77406	PD/CCBC
ARCHITECT OR ENGINEER J. B. Smith, Inc.		WORK ORDER OR CONTRACT NO 6005	
ESTIMATOR John Kolb, J. B. Smith, Inc.	CHECKER/ Reviewer Allen Purvis, J.B. Smith, Inc.	APPROVED J. A. Brown, DD-SED	

Special Conditions SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) FIELD TOTAL FAB	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
JOINT OCCUPANCY:							
a) Total Length of Job from IFB - Cal. Days 210 ÷ 7 = 30 Wks X 5 Days							
WK = 150 Days (b) Work Days 150 Days X 8 Hr/Day = 1200 Hrs.							
c) Total Labor Hrs. (See Sheet 5) 1200 - 120 = 10 Man Crew							
LOST PRODUCTIVITY:							
Elevator, Waiting Time & Congestion, (2%) Combustion Equip. (1.5%)							
Travel Distance, Vastness/Complexity (1.5%) Interference of							
Trades (2.0%) 7 Day Notice for Power Outage (2.0%)							
Work Congestion (1.5%)							
TOTAL LOSS PRODUCTIVITY:							
Labor Cost (From Sheet 4) Without Markups ($256,972)							
Plus-Mark-ups P.T I. 25% OH 15%, Profit 10%, M U. 10%, Bond 1%							
Use 10% of Total for Joint Occupancy 410,400 X 10%							$41,000
SPECIFIED DOWN TIME							
20 Days Down Time - I.F.B. (Page 7)							
10 Man Crew X 20 Days X 8 Hrs. = 1600 Hrs X $20. Hr = 30,000							
50% of Crew Used Elsewhere 32,000 X 50%							$16,000
Lost Production of 50% Consists of (a) Launch Related							
Activities (b) Weather Cond. (c) Wages Paid Union Per Contract							
and No Productivity (Show Time)							
ESCALATION:							
I.F.B. requires 210 Days Job Duration or 105 Days to							
Mid-Pt, OR say 4 Mo. Material and Vendor Quotes							
Estimates Increased 5% Annually, Labor Increased							
Due to Labor Contract Expiration & Automatic Increases							
In Present Contracts Present Avg Increases are 11% a YR. Labor							
11% & Mat. 5% = 16% ÷ 2 = 8%/YR Est Escalation 8%/12 MO = 2/3% per MO X 4 MO							$34,000
= 2.7% of (ECBC) 1,261,824 X 2.7%	TOTAL SPECIAL	CONDITIONS TO SHEET 6					$91,000

KSC FORM 21-243 (REV 4 80)

Figure E-5. Special Conditions Summary

APPENDIX F

SUPPORTING DATA

REFERENCE	SHEETS	COSTS
BLDG ESTIMATOR'S REFERENCE BOOK, WALKER PP 93 THRU 96, 106	3 THRU 17	A/S - LABOR/MATERIAL
ENGINEERING NEWS RECORD, MAY 1985 PP 24 THRU 25	9/10	A/S - FORMWORK AND FINISHES LABOR
CONTRACTOR'S EQUIPMENT OWNERSHIP EXPENSE	7	SITE WORK - GRADER, D-9 OPERATION
KSC CONSTR. COST INDEX	5,7,9,10, 12, 14,15,17,20,25	A/S, MECHANICAL, ELECTRICAL MARKUPS
COST MANUAL FOR PIPING AND MECHANICAL CONSTRUCTION	18 THRU 22	MECHANICAL LABOR/MATERIAL
NATIONAL PRICE SERVICE MONITOR	23 THRU 26	ELECTRICAL LABOR/MATERIAL
QUOTES, BROWNSVILLE, FLA, FIRMS		
R.L. BURGESS, A&N MANUFACTURING, 9/23/75	8	STEEL BAR JOISTS, MILL COSTS
AMERICAN STEEL FABRICATORS, T.O'NEAL, 9/27/75	8,9	STRUCTURAL STEEL SHOP COSTS
K. BROWN, TINKER CONCRETE, INC. 7/16/75	4	CONCRETE 8X12 BLOCK COSTS
COMPUTATIONS		
ATACHMENT A, PAGE 2	2	SITE WORK, FILL DIRT
ATTACHMENT A, PAGE 3	19	SPECIALIZED CONSTRUCTION, LABOR FACTORS SUMMATION

Figure F-1. Quotes and Backup Data

CODE C-95	BUDGET QUOTE FOR ESTIMATING	PAGE ____ OF ____

KENNEDY SPACE CENTER (Vendor told for estimating
VENDOR "QUOTE" FROM: pruposes only). Yes

COMPANY: ABC STEEL CO.

ADDRESS: 4500 Pine Street
Canaveral Groves, FL 32922

PERSONS NAME. Robert Steel

POSITION/TITLE. Chief Estimator

PHONE. 305-633-1234

DATE 4/30/85 UP DATED 6/30/85	WORK ORDER # 0576 G-1.000
ORGINATOR Varndell	PHONE # 867-2725
COSTS OBTAINED BY Wright	PHONE # 867-2725
DELIVERY SCHEDULE 4 WKS After Shop Dwg.	PCN # 77406
FOB POINT Job Site, LC-39 Area	
TOTAL WEIGHT 10 Tons	FREIGHT CHARGES 850

ITEM	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Structural Steel, Warehouse Steel Beam Co.	5*	Tons	900	4,500
2	Shop Fabrication (includes shop dwg)	5	Tons	625	3,125
3	Sand Blast (SP10)	5	Tons	140	700
4	Inorganic Zinc (0001)	5	Tons	220	1,100
5	Erection labor	5	Tons	800	4,000
	Bar hoist - 40 L20-(30 ea) & Bridging				
6	Fabricated Delivered Job Site	4	Tons	1,785	7,140
7	Field erection labor & equipment	4	Tons	915	3,660
	FOR OFFICIAL USE ONLY				
		9	Tons	3,112	17,550

REMARKS: (SPECS QUOTED, ETC.) (SPECS QUOTED ,ETC.) Spec Section 5 & 9L Read to ABC.

DRAWINGS 100 %, DATE 7/21/85 Reference Sheets S1-5

1. These are and labor material prices, Taxes, ins., OH & profit must be added to these prices.
2. Field touch-up painting included in erection prices if by painting sub, delete $40/ton.
3. Approximate quantities for obtaining vendor quote.

KSC FORM 21-671 (5/80)

Figure F-2. Budget Quote for Estimating

TYPICAL BREAK DOWN STRUCT. STEEL — COST ESTIMATE WORK SHEET

JOB NO. 6005 FCN 77406 | DWG NO TPK67392 | CODE C. 95 | DATE MAY 1, 1985 | SHEET 40 OF 42

TITLE ORDNANCE BUILDING - KSC — OFFICIAL USE ONLY | ESTIMATED BY J. KOLB & J.B. SMITH INC

DESCRIPTION	QUANTITY	UNIT	UNIT MAT'L	UNIT LABOR	EQ RENT	OWNER MATERIAL	CONTRACTOR MATERIAL	LABOR	EQUIP. RENTAL	TOTAL
BEAMS						FAB MAT'L				
MAT'L FROM WAREHOUSE ASTM A572 GR 50 FABRICATION	1	TON	900				900	COST INDEX .45/# DEL TO FABRICATION		
ENGINEERING SHOP DRAWINGS	1	TON	125			125				
FIELD MEASUREMENTS	1	TON	225			225				
SHOP FABRICATION PER TON	25	HR		25		625		OPF	10-16 HRS-TON	
SAND BLAST NEAR WHITE SP-10	300	SF	.20	234		70	60			
PAINT INORGANIC ZINC STD F0001	300	SF	.25	.50		150	75			
CONNECTIONS & WASTE 10%	200	LB	.40	45		80	90			
FREIGHT TO JOB	1	TON	45	35		45	40			
FIELD ERECTION					FAB	1,320	265			1785
UNLOAD, PLACING & TACK OR FLD BLT	1	TON		400				400	(6.7 PC PER TON)	
FIELD WELDING 30#/TON/1.5 HR	20	HR		20				400		
WELDING RODS 30#	30	LB	.40				12			
WELDING MACHINE	20	HR			150				30	
CRANE 40 TON - 150' BOOM	1	HR			85				85	
TOTAL LABOR-MATL-EQUIP RENT	1	TON				1320	(1177)	800*	(115)	3412
						1,177		TO LABOR	COLUMN	
NOTE-1. TYPICAL BREAKDOWN TO BE MADE ON ALL						115				
STEEL, SUCH AS BEAMS, TRUSSES, COLUMNS ETC.						2,612	(TO MATERIAL COLUMN)			
2. COMBINE EQUIP. RENTAL & CONTRACTOR INTO										
FAB. MATERIAL COLUMN. IN ORDER TO FIGURE										
YOUR SALES TAX.										
3. ALL QUOTES IN REGARD TO ERECTION, FOB MILL-WAREHOUSE OR								ABC STEEL CO		
PAINTING ETC SHOULD INCLUDE VENDORS NAME, PRICE & DATE.								FAB	1320 TON	
TOTAL								4-30	85	

Figure F-3. Cost Estimate Work Sheet, Typical Breakdown, Structural Steel

C. PIERCE
PRC 2421

METHOD 1 GFE ESTIMATING

DESCRIPTION	QUANTITY	UNIT	A UNIT MAT'L	A LABOR	A FACTOR	A OWNER MATERIAL	B CONTRACTOR MATERIAL	C LABOR	RENTAL
(1)			$	MH	(2A) %	GFE	$	MH	
GN_2 Panel, SS, 4' X 2', 6000-10,000 psi	3	EA	5,000	3.0	2.0	15,000	300	9.0	
	1	EA	1,000	1.0	3.0	1,000	30	1.0	
W.P., 5 valves, 4 meters, 5 outlets, and Electrical Connections	10	EA	13,400	-	(2B) -	134,000	NIC	NIC	
							330	10.0	Totals to Shts
(FIND NOs. A79553, A79554, A79555)	TOTAL	GFE VALUE (3)				150,000 (6)	(4)		D-4,E-6,E-7 & D-44

GFE FACTORS

1. Handling	0.5%	
2. Insurance	1.0%	(2A)
3. Storage	0.5%	
Total	2.0% per item	

GN_2 Panel, SS, 6' X 6' X8', 6000-10,000 psi
W.P. 9 valves, 10 meters, 9 outlets
(FIND NO. A76521)

GFE FACTORS

1. Handling	1.0%	(2B)
2. Insurance	1.5%	
3. Storage	0.5%	
	3.0%	

1. When listing GFE, describe by noun, physical characteristics (size, shape), functional design characteristics, and KSC drawing find number(s).
2. GFE factors may vary from equipment item to equipment item. Therefore, list GFE factors used in the estimate of each equipment item.
3. Multiply owner material cost of GFE by the associated GFE factor percentage in column A to obtain the contractor material cost in column B ($5,000 X 3.0 X 2% = $300).
4. Carry forward prices in column B and C to the Mechanical Division Trades' Summary sheets for markups. Identify column B and C costs as GFE costs in the trades' summaries.
5. Summarize GSE and value and carry forward to project summary.
6. Total value of GFE $150,000. Carry forward to project summary D-4, E-6, & E-7.

KSC FORM 1975 (4/65)
ACTIVE 9/85

Figure F-4. Method 1, GFE Estimating

APPENDIX G

SPECIAL SUMMARIES

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR BUILDINGS

FOR OFFICIAL USE ONLY

SHEET ____ OF ____

DRAWING NO. 79K67392	SHEETS 1-80	PCN 77406	LOCATION KSC, LC-39, VAB AREA
WORK ORDER CONTRACT 6005 NAS10-10190-5	ARCHITECT ENG MBER J. B SMITH (A&E) - PLANNING RESEARCH CORP (KSC)	ESTIMATOR Varnell, PRC 2421	CHECKER WRIGHT, PRC 2421
FACILITY NAME ORDNANCE BUILDING			CODE C-100 SUBMITTED May 1, 1985 (8//85)

CONSTRUCTION COSTS

DIV TITLE	QTY	UNIT	$ UNIT	$ BSF	TOTAL	DIV TOTAL
1 GNL COND O.H	4100	SY	29 40		120522	
(35 %)						
2 SITE WORK	7265	CY	28.59	30 65		207685
CLR GRUB	3	ACR	2545 13	1 86	7636	
DEMOLITION	610	SY	3.08	.46	1880	
ERTHWK /FILL	7265	SY	6 59	11.58	47868	
PILING						
UTILITIES (S&W)	2306	LF	40.00	22,50	92248	
PAVING BIT	3100	SY	15.31	11.56	47469	
OTHER GRASS	5600	SY	1 96	2.68	10986	
3 CONCRETE	207	CY	311 56	15 71		64493
FWRK	6342	SF	3 74	5 78	23682	
REBAR	8850	LB	92	1.73	7098	
CON	207	CY	124 78	6 30	25829	
CEMENT DECKS PRECAST	3240	SF	1.81	1 41	5851	
OTHER CRANE	95	CY	21 40	.50	2034	
4 MASONRY	9600	SF	3 43	8.04		32955
BLOCK	8000	EA	4 12	7 24	29678	
OTHER MORTON	31	CY	105 71	80	3277	
5 METALS	9.7	TON	4469 69	10 57		43355
STRUC STL	9 7	TON	4469.69	10.5	43355	
JOISTS & DECK						
MISC						
ALUM						
PLTFMS						
6 WOOD PLASTICS	260	BK	1.74	.08		348
CARPENTRY	260	BK	1.74	.08	348	
7 MOISTURE PROTECT	41	SQ	853.29	8.53		35074
WATERPRFNG	7880	SF	.92	1.76	7216	
INSULATION	7900	SF	1.00	1.92	7852	
ROOFING		SQ	423.17	4.23	17354	
SIDING						
DECK						
SHT MTL Al	568	LF	4.67	.65	2652	
8 DOORS & GLASS	384	SF	43.51	4.07		16708
DOORS	84	SF	46.26	.95	3888	
SPECIAL DOORS VERT LIFT	300	SF	42.73	3.13	12820	
GLASS & GLAZING						
FINISH HARDWARE						
OTHER						

DIV TITLE	QTY	UNIT	$ UNIT	$ BSF	TOTAL	DIV TOTAL
9 FINISHES	21343	SF	78	4,08		16742
WALL SYS						
FLOOR SYS						
CEILING SYS						
PAINT & COVER	21343	SF	78	4.08	16742	
OTHER						
10 SPECIALTIES						
11 EQUIPMENT						
12 FURNISHINGS						
13 SPECIAL CONSTR						
ELEV FIR SYS						
OTHER						
14 CONVEYING SYS	15	TON	5947 33	21 76		89176
CRANES BOOK 16' H SPAN 60'	15	TON	5945 07	21 75	89176	
DOORS EXPLOSION PROOF						
OTHER						
15 MECHANICAL	20	TON	547 65	25.84		305949
PLUMBING	14	FIXTURE	1115 00	1 81	15619	
FIRE PROTECT						
VENTILATING	4	EA	2634 00	2 57	10536	
HEAT & A/C	20	TON	3680 00	17 95	73600	
COMP AIR	5	EA	1260 00	1.51	6303	
16 ELECTRICAL	2000	KVA	265.746	129.63		531492
LIGHTING	67	EA	131.33	2.14	8799	
CABLE & WIRE	12020	LF	6.30	12.60	72157	
CONDUIT	2675	LF	3.30	2.14	8849	
EXTER SYS	2000	KVA	214.78	10 38	29569	
SPCL SYS UNINTER PWR						
GROUNDING	18	EA	675	2 94	12148	
OTHER						
RSC SPCLZD CONSTR	50	LF	197 76	2 41		9888
HYPER SYS						
CRYO SYS						
POWER (LH)	50	LF	197 76	2 41	9888	
OTHER						
PROJECT TOTALS						1,154,965

DESCRIPTION

SCOPE (Circle one)	BASIC PLAN (Circle one)	COMMENTS
1 FAIR	A SQUARE	EXCELLENT GOVT
2 AVERAGE	B RECTANGULAR	ESTIMATE
3 GOOD	C IRREGULAR	$57000 SPECIAL
4 COMPLEX	D VERY IRREGULAR	COND NOT NEEDED
5 SOPHISTICATED	E	DUE TO ECONOMIC CONDITIONS

DESIGN DATA

BLDG TYPE CONC BLOCK & STEEL
CAPACITY 1 60 X W 68 X H 20
STRUC FRAME REINF CONC & BEAM
EXTERIOR WALL REINF CONC & CONC BLOCK
HEIGHT 1 STORIES 30 FT
GROUND FLOOR AREA 4100 SF
TOTAL FLOOR AREA 4100 SF
VOLUME 81,600 CF
PERCENT AIR CONDITIONED 100% 20 TONS
OTHER

SPECIAL FEATURES

GFE 3 PANELS @ 50,000
X-L SUBSTATION TOTAL 150,000
15-TON CRANE
UTILITIES DESIGNED FOR ADDITIONS

CONSTRUCTION BID DATA (IFB 10-00-123-5)

TOTAL BLDG SF 4100

ARCH/STRUC	$ 74.34 /BSF	$ 304,780
INTERIOR MECH	$ 25.84 /BSF	$ 105,952
INTERIOR ELEC	24.86 /BSF	$ 101,923
TOTAL INTERIOR	$ 123.09 /BSF	$ 504,671
TOTAL EXTERIOR	$ 154.25 /BSF	$ 632,422
TOTAL CONSTR	$ 277.34 /BSF	$ 1,137,093
ADDITIONAL A	$ 2.41 /BSF	$ 9888
B	$ 26.06 /BSF	$ 106,865
TOTAL PROJECT EST	$ 307.76 /BSF	$ 1,261,826

BID DATE 8/1/85
AWARDED TO D&D CONST $ 1,130,000
CONSTRUCTION TIME SPAN 180 CALENDAR DAYS
NO OF BIDDERS 7 POSITION OF GOVT EST 2
PERCENT DIFFERENCE AWARDED BID AND GOVT EST 1%

BIDDERS

D&D CONST	(L)	$ 1,251,520
GOVT		$ 1,261,826
WINDFALL, INC		$ 1,362,780
ABC CONST		$ 1,385,000
J B. SMITH, INC		$ 1,419,865
CRAY		$ 1,610,500
ALLEN	(H)	$ 1,700,000

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Figure G-1. System Summary of Government Estimate for Buildings

FOR OFFICIAL USE ONLY

LABOR AND MATERIAL COST SUMMARY FOR BUILDINGS

SHEET ___ OF ___

DRAWING NO: 79K67397	SHEETS: 80 SHEETS	PCN: 77406	LOCATION: KSC, LC-39 VAB AREA	PROJECT: MAINTENANCE BUILDING	
WORK ORDER CONTRACT: PRC 6005 NAS10-10196-5	ARCHITECT ENGINEER: I B SMITH INC (A&E) PLANNING RESEARCH (KSC)		ESTIMATOR: VARNDELL, PRC 2421	CHECKED: Wright, PRC 2421	CODE: C-95 & 100 SUBMITTED: May 1, 1985

LINE ITEM	SITE WORK LABOR	SITE WORK MATERIAL	ARCHITECTURAL STRUCTURAL LABOR	ARCHITECTURAL STRUCTURAL MATERIAL	MECHANICAL LABOR	MECHANICAL MATERIAL	ELECTRICAL LABOR	ELECTRICAL MATERIAL	SPECIALIZED CONSTRUCTION LABOR	SPECIALIZED CONSTRUCTION MATERIAL	OTHER LABOR	OTHER MATERIAL	PROJECT TOTALS
SITE WORK	29141	49651											78792
ARCHITECTURAL/STRUCTURAL			98373	110078									208451
INTERIOR MECHANICAL													
A/C					15146	31844							46980
PLUMBING					1689	6187							9876
COMP AIR					1697	2184							3881
OTHER VENT					1661	5163							6824
INTERIOR ELECTRICAL													58017
POWER & LIGHT							14794	43223					
GROUNDING							5097	2165					
EXTERIOR UTILITIES													
MECHANICAL											38874	30651	49525
ELECTRICAL											64545	21259	278804
POWER & LIGHT													
INSTR & COMM													
SPECIALIZED CONSTRUCTION													
STRUCTURAL													
MECHANICAL									3955	1992			5947
ELECTRICAL													
OTHER													
SUBTOTAL LABOR	29141		98373		22193		19891		3955		83619		256922
SUBTOTAL MATERIAL		49651		110078		45378		45388		1992		244910	497398
SALES TAX 5 %		2483		5504		2269		2269		100		12246	24871
P T & I 25 %	7285		24593		5548		4973		989		20854		64247
SUBTOTAL	36426	52134	122966		27741	47647	24864	47657	4944	2092	104274	257156	
TOTAL	88560		218548		75388		72521		7036		361430		843483
CONTR OVERHEAD 15 %	13284		32782		11308		10878		1055		54215		126522
SUBTOTAL	101844		274330		86696		83399		8091		415645		970005
CONTR PROFIT 10 %	10184		27433		8670		8340		809		41565		97001
SUBTOTAL	112028		301763		95366		91739		8900		457210		1067006
PRIME MARKUP 10 %	11202				9537		9174		890		45721		76524
SUBTOTAL	123230		301763		104903		100913		9790		502931		1,143,708
BOND 1 %	1232		3017		1049		1010		98		5029		11437
TOTAL	124462		304,780		105952		101,923		9888		507960		1,154,,965

NOTES

NSC FORM 21-369 (9/76) SUPERSEDES 9/85

Figure G-2. Labor and Material Cost Summary

COMPARISON OF BUDGETED AND ESTIMATED COSTS **FOR OFFICIAL USE ONLY** SHEET ____ OF ____

DRAWING NUMBER: 79K67329 | SHEETS: 80 SHTS | TEL: 77406 | LOCATION: KENNEDY SPACE CENTER, FL | PROJECT: ORDNANCE BUILDING

WORK ORDER CONTRACT: 6005 | ARCHITECT ENGINEER: J. R SMITH, INC. - ROCKET CITY, UTAH | ESTIMATOR: VARNDELL PRC-2421 | CHECKER: WIGHT, PRC-2421 | CODE: C-100 | SUBMITTED: 7/25/85 | UPDATED: 8/8/85

BUDGETED LINE ITEMS	BUDGETED COSTS		ESTIMATED COSTS MAR 84 CODE PER	% DIF	NOV 84 CODE B-30	% DIF	FEB 85 CODE C-60	% DIF	MAR 85 CODE C-90	% DIF	MAY 85 CODE C-95	% DIF	AUG 85 CODE C-100	% DIF	CODE LOW BID	% DIF	CODE	REMARKS
I SITE WORK	885,000	+18	104,000	+13	117,500	+	119,650	+ 3	1,133,000	+ 1	124,562	0	1,124,462	- 1	123,600*			*BREAKDOWN AT PRE-AWARD WORK CONF 8/15/85
II BUILDING STRUCT																		
ARCH/STRUCTURAL	237,000	+10	(B) 260,000	+ 4	270,500	+ 6	287,895	0	287,895	+ 6	304,780	0	304,780	- 7	299,340			
MECHANICAL	56,000	+41	79,000	+20	(C) 95,000	+ 7	102,000	+ 4	105,952	0	105,952	0	105,952	+ 4	110,000			
ELECTRICAL	94,500	+ 1	95,000	+ 8	101,000	0	101,500	0	101,700	0	101,923	0	101,923	- 2	99,750			
III UTILITIES TOTAL	500,000	+ 1	503,000	+ 0	504,000	0	505,200	0	505,900	0	507,961	1	507,961	2	497,000			
IV SPECIAL CONST	9,000	0	9,000	+ 6	9,500	+ 7	9,700	+ 2	9,888	0	9,888	0	9,888	+ 1	10,000			BECAME OPTION I AT C-100
EQUIP (DATA PROCESSING) & SOLAR HEAT (A)	35,000	+14	40,000	-100														
ENGINEERING/ECBC	1,018,200	+ 7	1,090,000	+ 1	1,097,500	+ 1	1,125,300	1	1,135,000	+ 2	1,154,963	0	1,154,963	- 1	1,139,690			
ESCALATION/SPECIAL COND	(34 27) 355,300	-19	(26)283,400	-23	(20)219,500	13	(17) 191,300	-5	(16) 181,600	11	(14)161,695	0	91,031	+ 7	97,000			( )% OF ESCAL
AMEND 1 & 2	1,393,500											100	15,830	- 6	14,830			
BID COST (ECBC) W/SPECIAL COND.	1,393,500	- 0	1,373,400	- 4	1,317,000	0	1,316,600	0	1,316,600	0	1,316,658	- 2	1,261,824	- 1	1,251,520			BID COST COMPARISON TOTAL
SUPER & ADMIN	139,400	- 0	140,340	- 4	131,700	0	131,660	0	131,660	0	131,666	- 2	*(128,969)	- 3	(125,152)			
CONTINGENCY (GOVT)	153,300		153,900	- 4	144,870	0	144,826	0	144,826	0	144,833	- 2	*(141,866)	- 3	(137,667)			
CURRENT COST EST. CCE	1,686,200	- 1	1,667,640	- 5	1,593,570	0	1,593,086	0	1,593,086	0	1,593,159	- 4	*(1,532,659)	- 1	(1,514,339)			*C-100 FOR COMPARISON
DATA PROCESSING/SOLAR HEATING				+100	(D) 68,000	+ 1	69,000	+0	70,000	+ 1	71,000	+ 4	74,000	14	65,000			PURCHASED SEPARATELY
GFE VLAUF	150,000	0	150,000	0	150,000	0	150,000	0	150,000	0	150,000	0	150,000	0	150,000			SUPPLY CONT 5/7/85 65,000
PROJECT TOTAL	1,836,200	- 1	1,817,640	0	1,811,570	0	1,812,086	0	1,813,096	0	1,814,159	- 3	1,756,659	- 2	1,729,339			
PCT DIFFERENCE BUDGETED ESTIMATED TOTALS										0		1		- 4				

NOTES (A) EQUIP (DATA PROCESSING) & SOLAR HEAT PURCHASED SEPARATELY AFTER PER

(B) SAND BLAST/INORGANIC & POLY PAINT ONSITE CAUSED INCREASE

(C) PRICE CHANGE ASBESTOS NO LONGER USED.

(D) DATA PROCESSING & SOLAR HEAT COST INCL ESCAL PURCHASED SEPARATELY

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Figure G-3. Comparison of Budgeted and Estimated Costs

APPENDIX H

GLOSSARY OF TERMS

APPENDIX H

A glossary is provided below to define terms commonly used in construction and construction cost management.

GLOSSARY OF GENERAL TERMS

ALLOWANCE - an item of cost or monetary significance, which has the following characteristics:

a. Reasonableness

b. May be of the "unit price" or "lump sum" variety

c. Should be inclusive of all overhead, profit, and general conditions

CHECKER - responsible for checking math extensions totals. Check that all subtotals are brought to summary with page number noted on both sheets. See that summaries are complete and insure accuracy of transferred totals.

COST - any or all expenditures, including such items as hidden costs, profit, taxes, and interest associated with a construction project

COST ACCOUNTING - the historical reporting of disbursements and costs and expenditures on a project. When used in conjunction with CCE estimates, cost accounting can assist in giving the precise status of the project, to date.

COST ANALYSIS - a method using historical and planned project data to ascertain the most likely costs of future and on-going projects. Cost analysis may also be applied to escalation, as well as cost differentials between various localities, types of buildings, types of estimates, types of projects, and time of year.

COST ENGINEERING - the application of scientific principles and techniques to problems of cost estimation, cost control, and profitability dealing with the control, management, and manipulation of costs pertaining to a single project or a series of projects. The cost engineering discipline is involved in life cycle costing, conceptual cost estimating, cost escalation, cost index, bid strategy, analysis of cost data, cost analysis, cost prediction, cost control, and management of costs applicable to a project.

COST ESTIMATOR - responsible for take off of drawing specs and IFB. Apply established unit prices and labor rates to apply to basic construction/ fabrication and installation costs. Apply appropriate overhead, profit, and burden rates. Apply special condition. Obtain quotes on major items. Review for completeness of drawing. Evaluate and comment on cost-saving construction; review bid documents for cost effectiveness.

CONTINGENCY - the allocation of a certain percentage or sum of money to compensate for unknown costs which may arise in the future. Contingencies are allocated on the basis of probability and past experience to assure that the total budgeted or bid sum is not exceeded by actual costs. Contingencies appear most frequently as:

a. Design Contingency - an allocation for unknown design features and details. It is higher at the initial schematic design phases of a project and decreases as more finite planning details become known and working drawings are developed.

b. Estimating Contingency - an allocation utilized by the cost engineer or estimator to compensate for uncertain, unknown, or fluctuating cost situations in order that actual costs will not exceed estimated costs.

c. Construction or Field Contingency - an allocation established to compensate for unbid subcontractable items and unknown and unforeseeable field conditions.

d. Change Order Contingency - an allocation for design refinements and the correction of design errors for which the contractors are entitled to additional and reasonable compensation.

CURRENT COST ESTIMATE (CCE) - The CCE is that cost that reflects the latest and best total project estimated cost available based on design or construction progress and constitutes the most realistic estimate of ultimate final project costs. It includes: the engineering cost to build the project in today's dollars plus contingencies; escalation to the mid-point of construction; and supervision, inspection, and engineering services. The CCE is also known as CWE current working EST by other government agencies.

ECBC C-95 - estimated construction bid cost based on completed design package. It is the final estimate before bid package has been released to potential bidders. The C-90 review changes have been incorporated at this level. Barring addenda/amendments, these drawings and specifications will be the same as those sent to prospective bidders.

This package should include all quotes from vendors, element summary, labor and material summary, system summary, general condition sheet, cover sheet, and list of government furnished equipment, including approximate cost of the material and cost of handling the equipment. All sheets must be stamped: For Official Use Only.

BID COST EST-C-100 - Estimated bid cost for complete bid package. It is the offical government estimate and is based on the same package that was supplied to all prospective bidders. The C-100 may have special conditions added to total during bidding period. These special conditions calculations shall be included in C-100. They may be used by A&E and/or government.

The estimate should be treated as a bid for the government. It must include all the information supplied in the C-95 estimate and update, if necessary, and add special conditions determined by the IFB. Estimate should also include any amendment and a signed bid form found in the IFB. All sheets of the estimate must be stamped: For Official Use Only.

ENGINEERING COST - is the total estimated cost of labor, materials, equipment, and contractor's markup in today's dollars. This cost is used to develop the CCE. The engineering cost does not contain government contingencies, S&A, escalation, or design costs.

ESCALATION - an increase in costs of interest, labor, materials, or other factors which add to the total direct cost of a project, measured over time.

FIVE-FOOT LINE - an imaginary line outside of and conforming to the exterior wall of building. The 5-foot line is the traditional separation between interior (building) and exterior work.

FRINGE BENEFITS - the added costs normally associated with labor. Fringe benefits include profit sharing, health, welfare, pension, apprentice training, educational programs, union dues, vacation, holiday insurance premiums, and other similar items which are fringe to direct payroll costs.

GENERAL OVERHEAD - the fixed cost of operating a business. It includes office, plant, equipment, staffing, and expenses thereof maintained by a contractor for his general business operation.

JOB OVERHEAD - the expense of items such as trailer, toilets, telephone, superintendent, transportation, temporary heat, testing, power, water, clean-up. It may include the costs for bond and insurance associated with the particular project.

LIFE CYCLE COSTS (OR TOTAL COSTS) - includes all costs from inception through obsolescence of a part, subsystem, system, or an entire building project. This cost includes all construction and operational costs.

MARKUP - includes such percentage applications as general overhead, profit, and other indirect costs. When markup is applied to the bottom of a bid sheet for a particular item, system, or other construction price, any or all of the above items (or more) may be included, dependent on local practice.

MILESTONE - a particular event in a schedule sequence which has increased significance above and beyond the more common schedule activity or event. For example, building close-in or top-out would be a milestone event.

NASA/KSC LEAD COST ENGINEER - provides the management overview of KSC cost estimates with responsibility for standards and guidelines to be used by A/E firms, A/E support contractor, and in-house personnel for preparation of government cost estimates. Coordinates and reviews A/E, support contractor, and in-house cost estimates to assure accuracy of cost and conformity to established guidelines and standards.

NASA/KSC LEAD DESIGN ENGINEER - provides the project technical lead with responsibility for the work (preliminary engineering, design concepts, design, change to design, design analysis, cost estimating, and resolution of design problems) on his project within a framework of established project scope, milestone schedules, and cost controls. He is the single point of contact for systems engineers, cost engineers, cost estimators, and other personnel supporting his project.

NEGOTIATIONS - discussions between owner and/or contractor or vendor held to ascertain that all items of work are included and that a proper and reasonable price has been agreed upon by both parties.

OPERATIONAL COST - all fuel, lubricants, and normally scheduled parts changes necessary to keep a subsystem, system, particular item, or entire project functioning. Operational costs also include general building maintenance, energy, cleaning services, taxes, and similar items.

OWNER - the individual or company who pays the bills and for whose benefit the project is being constructed.

PRODUCTIVITY - the rate at which a given crew or mechanic accomplishes final in-place installation of an item or system within a project. Productivity must be assessed on an item-by-item basis to properly schedule project work.

PROFIT - the bottom line or anticipated reward for accomplishing work. Profit has three parts:

a. Anticipated Profit - the profit projected from the beginning to the end of the project at time of bid

b. Gross Profit - the total before-tax (and possibly before general overhead expense) profit associated with a particular project or company

c. Net Profit - the after-tax, after disbursement bottom line figure of a particular company or individual or project

PROJECT SUMMARY - is a line item summary of construction bid costs by site-work; building/structures; architectural, mechanical, and electrical work; exterior utilities; and specialized construction. It also shows the current cost estimate with markups for escalation, contingencies, and S&A.

REVIEWER - responsible for complete estimates in regards to format and accuracy per KSC Specifications Management Overview for Cost Effective Design and Construction.

QUALITY SURVEY - the technique of listing all items and salient features of the work and the quantities thereof necessary to build a particular project. Quantity survey may be done with productivity in mind, but does not include pricing.

SCHEDULING - the method whereby sequence of events of administration, design, procurement, and erection of a facility or structure are organized in a logical manner to assure that all elements of the project are accomplished within the specified completion date. Scheduling may be by bar chart, or critical path method (CPM).

SITE DEVELOPMENT - all work associated with utilities, construction, excavation, clearing, grading, parking, and landscaping outside of the 5-foot line.

VALUE ENGINEERING - the systematic application of recognized techniques which identify the function(s) of a product or service, establish the worth of that function, and reliably provide the necessary function at the lowest overall cost (value engineering, value analysis, and other similar terms are considered to be synonymous).

WAGE RATE - the hourly, daily, or weekly cost, including statutory overburden (taxes) of a person who works for wages, such as mechanics, laborers, and steamfitters.